IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XX SEPTEMBER 1941

FOSTER (A. C.) & TATMAN (E. C.). **Effect of certain fungicides and environmental factors on the rate of transpiration of Tomato plants.** —*J. agric. Res.*, lxi, 10, pp. 721–735, 2 figs., 1940.

In greenhouse experiments conducted during 1933–4 at the Arlington Experiment Farm, Virginia, the effect of copper phosphate-bentonite-lime mixture, zinc sulphate-lime, and Bordeaux mixture on the rate of transpiration of maturing tomato plants was studied. The two last-named sprays had no significant effect on the rate of transpiration, but copper phosphate-bentonite-lime caused a highly significant increase regardless of various environmental factors, indicating that these do not influence the effect of the sprays on transpiration. The rate of transpiration was markedly reduced by added increment of soil nitrogen, reduced soil moisture, and reduced air temperature.

WELLMAN (F. L.). **Epinasty of Tomato, one of the earliest symptoms of Fusarium wilt.**—*Phytopathology*, xxxi, 3, pp. 281–283, 1 fig., 1941.

One of the earliest symptoms of the tomato wilt, due to *Fusarium bulbigenum* var. *lycopersici*, in inoculation experiments under the conditions already described [*R.A.M.*, xix, p. 170] at the United States Horticultural Station, Beltsville, Maryland, was observed to be epinasty, the angles formed between the stem and first mature leaf petiole on 18 affected plants ranging between 67° and 136° as compared with 51° to 55° on healthy ones. The following was the approximate sequence of disease effects on Bonny Best plants. The cotyledons and juvenile leaf began to show signs of epinasty on the third day, on the fourth two leaves above the juvenile became similarly affected, incipient chlorosis developed, and the veins at the base of the plant darkened so as to be visible through the cortex; the next day the three remaining leaves and bud showed an epinastic response; by the seventh day all the leaves had wilted and the veins of the stem were dark to within a short distance of the terminal bud; on the ninth the leaves were dead but still attached to the stem, which showed a watery softening, the entire vascular system was discoloured, the plant prostrate, and the stem only 6 in. long with five leaves, compared with 9 in. and eight leaves in the controls.

THOMPSON (G. E.). **Leaf-spot diseases of Poplars caused by Septoria musiva and S. populicola.**—*Phytopathology*, xxxi, 3, pp. 241–254, 2 pl., 1 fig., 1941.

Leaves of *Populus balsamifera* bearing *Septoria musiva* [*R.A.M.*, xviii, p. 770] were collected in the autumn and placed in wire baskets out of doors. The following spring the leaves bore perithecia of a species of *Mycosphaerella* believed to be new to science and named [with a Latin diagnosis] *M. populorum* n.sp. Inoculation experiments with this fungus in the greenhouse at Cornell University, New York, gave positive results on 26 species of *Populus*, including *P. balsamifera*, *P. berolinensis*, *P. canadensis* and its vars. *serotina* and *eugenei*, *P. candicans*, *P. maximowiczii*, three vars. of *P. nigra*, *P. robusta*, *P. tacamahaca*, and *P. tremuloides*, *P. alba* and *P. epirotica* remaining free from infection. The leaf-spotting caused by this fungus is widespread in the United States and Canada, the individual lesions being circular, irregular or angular, 1 to 15 mm. in diameter, reddish- to dark brown, with yellow borders, and sometimes zonate. Twig lesions or cankers were observed only on one twig of *P. szechuanica*. During 1936 the ascospores of *M. populorum*, which are irregularly biseriate, naviculate, uniseptate, and hyaline, measure 16 to 28 by 4·5 to 6μ, and are borne in fasciculate, cylindrical-clavate, short stipitate asci, 54 to 70 by 13 to 16μ, were discharged from the black, globose perithecia, 64 to 106 by 64 to 96μ, following rain from 1st May to 29th August. The conidial stage developed on spots on living leaves throughout the summer and globose spermogonia, 48 to 96 by 48 to 80μ, containing unicellular, oblong or rod-shaped, hyaline spermatia, 4 to 6·5 by 1·5μ, were produced in September and October, this phase apparently not having been previously recorded. Isolations from ascospores and conidia usually gave rise to the same type of growth on potato dextrose agar at 24° C., consisting of compact, white colonies, with greyish-green centres and white-edged borders, the pycnidia embedded in which extruded pinkish masses of conidia. On the leaf the conidia were cylindrical or sometimes tapering, straight or curved, hyaline, 1- to 4-septate, 28 to 54 by 3·5 to 4μ, but considerable variation was observed in this fungus and on dry, arid leaf spots the conidia were elliptic-fusiform to cylindrical, hyaline, continuous or uni- to biseptate, 12 to 29 by 3·5 to 4μ. A certain number of cultures were atypical, failing to form greenish centres and produce conidia, while others were intermediate in respect of coloration and capacity for sporulation. The temperature range for ascospore germination in *M. populorum* was from 3° to 30°, with an optimum at 27°.

Leaves infected with *S. populicola* Peck (*Rep. N.Y. St. Bot.*, xl, p. 61, 1886) were also overwintered in wire baskets out-of-doors and developed the perithecial stage *M. populicola* n.sp. [with a Latin diagnosis]. Like the foregoing, this disease is confined to the United States and Canada. The lesions are similar to those produced by *M. populorum*, but individually smaller (1 to 8 mm. in diameter), though frequent coalescence results in the formation of blotches covering ⅓ to ½ the leaf area. The fungus is characterized by black, globose perithecia, 96 to 160 by 96 to 144μ, and cylindrical-clavate, short stipitate asci, 64 to 90 by 13 to 16μ, containing eight irregularly biseriate, fusiform, uniseptate,

hyaline spores, 22 to 32 by 6 to 6·5μ. The conidial stage occurs in lesions on the living leaves during the summer, and in August and September are formed dark-coloured, globose or spherical spermogonia, 96 to 112 by 64 to 112μ, containing oblong to rod-shaped, straight or slightly curved, unicellular, hyaline spermatia, 6·5 to 8 by 1 to 1·5μ, this phase in the life-cycle of the pathogen being apparently hitherto undescribed. The type of growth produced by ascospores and conidia on potato dextrose agar resembled that characteristic of *M. populorum*. On the leaves the filiform to clavate, 2- to 5-septate, hyaline conidia measure 45 to 80 by 3·5 to 4·5μ (average length 62μ) as compared with 54 to 99 by 4 to 5μ (average length 76μ) in culture. The optimum temperature for growth was found to lie between 21° and 24°. Only three species of poplars reacted positively to inoculation with *M. populicola*, viz., *P. szechuanica*, *P. tacamahaca*, and *P. trichocarpa*.

Sylvén (N.). **Skogsträdens förädling. II.** [Improvement of forest trees. II.]—*Skogen*, xxviii, 5, pp. 81–83, 3 figs., 1941.

In connexion with a discussion of the problem of breeding in Swedish forest nurseries, the writer cites two fungal parasites attacking their hosts with such varying degrees of intensity that the selection of resistant individuals should present no great difficulty, viz., the devastating spruce rot [röta = (?) *Fomes annosus*: *R.A.M.*, xvi, p. 146] and birch rust [*Melampsoridium betulinum*: ibid., xv, p. 326]. In different nurseries plots of spruces are already being raised from seed derived from immune trees in the midst of heavily infected stands. An analysis of the rust incidence among 50 birches revealed two entirely free from infection, four showed only traces of the pathogen, 16 were slightly attacked, 14 somewhat more severely, four with moderate intensity, five heavily, and five very virulently by the disease. By the systematic selection for propagation of immune or highly resistant trees from badly diseased groups it should be feasible to develop a race of rust-immune birches.

Pady (S. M.). **Preliminary observations on the aecial hosts of Melampsorella.**—*Trans. Kans. Acad. Sci.*, xliii, pp. 147–153, 1 pl., 1940.

The writer discusses and tabulates the principal differences between the forms of *Melampsorella cerastii* occurring on its two aecidial hosts, *Picea engelmanni* and *Abies lasiocarpa*, in the Gothic district of Colorado. The witches' brooms produced by the rust on the former are much larger (up to 6 ft. in diameter) than those on the latter (1 to 2 ft.) and are reddish-orange instead of yellowish, the type of growth being diffuse on *P. engelmanni* and very compact on *A. lasiocarpa*; on the former host, the branches radiate in all directions while in the latter they all point upwards, and the leaves are much shortened and thickened. The pycnidia vary in a number of characters on the two kinds of tree, including their dimensions (99 to 135μ in height by 99 to 126μ in breadth on *P. engelmanni* and 31 to 62μ in height by 98 to 185μ in breadth on *A. lasiocarpa*), and the same applies to the aecidial stage, the spores measuring 18 to 33 by 14 to 21μ on the former and 14 to 23 by 10 to 18μ on the latter. Finally, the haustoria on *P. engelmanni* are long, finger-like, or clavate, measuring up to 40μ in length, while

those on *A. lasiocarpa* are knob-like or furnished with numerous terminal finger-like projections, up to 26μ long.

Two species of *Melampsorella*, rather than two variants of a single species, are thought to be probably concerned, but an examination of the teleutospore stage on *Cerastium* and *Stellaria* is necessary to settle this point.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. XII.**—*Pap. Mich. Acad. Sci.*, xxvi (*1940*), pp. 107–121, 7 pl., 1941.

This further instalment of the writer's critically annotated list of resupinate Polypores from the Great Lakes region of the United States [*R.A.M.*, xix, p. 685] comprises seven species, of which three are new [with Latin diagnoses], viz., *Poria taxodium* on *Taxodium distichum* in Illinois, *P. carnicolor* on *Tsuga heterophylla* in Idaho, and *P. carnegiea* on *Carnegiea gigantea* in Arizona, the last-named being the first Polypore to be recorded on cactus. *Coriolellus cuneatus* Murr. on *Thuja plicata* in British Columbia is renamed *Polystictus cuneatus* comb. nov.

Poria taxodium presents many features in common with *P. xantha* [ibid., xviii, pp. 76, 362] or its var. *crassa*, from which it differs, however, in its spore dimensions of 4 to 5·5 by 4μ instead of 4 to 6 by 1 to 1·5μ. The spores of *P. vulgaris*, another allied species, measure 4 to 6 by 1 to 1·5 or 2μ. Attention is drawn to the prevalent confusion in the current interpretations of *P. vaporaria*, one designating a common greenhouse fungus (herein referred to as *P. vaillantii*) with spores measuring 5 to 7 by 3 to 3·5μ and the other (*P. vaporaria* proper) being the Polypore of Swedish pine forests. The fungus described by Gäumann as *P. vaporaria* [ibid., xviii, p. 493] is actually *P. versipora* (Pers.) Romell. *P. vaillantii*, which also causes a rot of basement timbers resembling that due to *Merulius lacrymans*, closely resembles *P. taxodium*, but the two may be differentiated by the rhizomorphic growth habit and somewhat larger pore mouths of the former.

Hitherto no special precautions against the spread of *Fomes annosus* have been necessary in American forests, but indications are not wanting that it may eventually become as serious a cause of plantation failure, e.g., in North Carolina and California, as it already is in Europe. The fungus is the indirect agent of a certain amount of windfall in the United States and in some localities is responsible for widespread decay in mining timbers.

VERRALL (A. F.). **Fungi associated with stain in chemically treated green lumber.**—*Phytopathology*, xxxi, 3, pp. 270–274, 1941.

Continuing his studies on the fungal staining of green timber in the southern United States [*R.A.M.*, xix, p. 315], the writer determined the fungi occasionally associated with the defect on treated lumber. In his tests the wood was treated with 0·31 per cent. lignasan (6·25 per cent. ethyl mercuric chloride) and 1·03 per cent. dowicide (sodium tetrachlorophenolate and sodium 2-chloro-ortho-phenyl phenolate, 1:1) [ibid., xviii, p. 363 *et passim*]. In pine wood (both treated and untreated) *Ceratostomella pilifera* was the principal agent of staining, followed by *C. ips* [ibid., xx, pp. 315], the former being isolated from

71 per cent. of the samples in both the lignasan-treated and control lots, and from 87 and 73 per cent., respectively, in the dowicide-treated and control, while the corresponding figures for the latter were 11, 13, 13, and 14 per cent., respectively. None of the other fungi present caused more than 6 per cent. infection. On hardwoods both treatments reduced the incidence of infection by *C. pluriannulata*, lignasan from 71 to 37 and dowicide from 77 to 23 per cent., the corresponding figures for *Graphium rigidum*, *Diplodia natalensis*, and *Endoconidiophora moniliformis* being from 48 to 27 and 35 to 8 per cent., from 19 to 0 and 21 to 0 per cent., and from 29 to 2 and 42 to 15 per cent., respectively. *E. coerulescens*, on the other hand, proved refractory to control by either of the chemicals. No differences in the staining flora occurred on treated and untreated hardwood, and although some were observed in the fungi on treated and non-treated pine these are insufficient to account for the severe staining which sometimes occurs.

CARTWRIGHT (K. St. G.). **Dry rot outbreak after fire. Damage and how it can be prevented.**—*Builder*, *Lond.*, clix, 5094, p. 291, 1940.

Every year a proportion of the numerous cases of dry rot [*Merulius lacrymans*] submitted to the Forest Products Research Laboratory is found to originate as a sequel to fire damage, and attention is drawn to the likelihood of an increase in such outbreaks owing to the risk of incendiary bombs necessitating the use of large quantities of water, which thoroughly soak the woodwork and provide ideal conditions for the development of the fungus, especially where buildings have to be evacuated for considerable periods. Essential precautions to minimize damage of this kind include a preliminary waterproofing of the roof, gutters, &c., before embarking on further repairs; removal of all floor coverings, which retard the escape of moisture, and of damp insulating material ('deafening') between floors and ceilings; and provision of adequate ventilation combined with a warm atmosphere (the latter alone tends to accelerate the progress of the rot).

NIETHAMMER (ANNELIESE). **Microscopic fungi in mechanical and groundwood pulp.**—*Zellstoff u. Papier*, xx, 9, pp. 266–268, 270; 10, pp. 298, 300, 302, 304, 1940. [German. Abs. in *Bull. Inst. Pap. Chem.*, xi, 6, p. 200, 1941.]

Experiments [at the German Technical College, Prague] showed that various species of *Trichoderma*, *Penicillium*, *Cladosporium*, *Aspergillus*, *Macrosporium*, *Fusarium*, and *Verticillium* are capable of growth on sulphite, soda, and groundwood pulps, moisture and small quantities of salt in solution being essential to their development. The species of *Fusarium* concerned were found to prefer low temperatures, a factor deserving consideration in the selection of storage rooms: *Aspergillus* spp., on the other hand, thrive only at temperatures above those prevailing in ordinary rooms. A mutual antagonism, of potential value for control purposes, was shown to exist between some of the fungi involved in pulp spoilage; *Penicillium* spp., for example, may be overgrown and destroyed by *Cladosporium* and *Fusarium* spp. While some of the organisms under observation are confined to the surface, others penetrate more deeply into the pulp and may ruin the entire stock.

All moist material, especially when contaminated by any kind of impurity, must be regarded as liable to fungal invasion. Dilute solutions of sulphur dioxide were effective against the spores, conidia, and hyphae of the pathogens without injuring the pulp.

BURKHOLDER (W. H.). **The black rot of Barbarea vulgaris.**—*Phytopathology*, xxxi, 4, pp. 347–348, 1941.

Phytomonas barbareae n.sp. (or *Xanthomonas barbareae* if Dowson's system of bacterial nomenclature [*R.A.M.*, xviii, p. 659] be accepted) is the name proposed for a pathogen of the prevalent New York weed *Barbarea vulgaris* suspected of being identical with *P.* [*Pseudomonas*] *campestris*. In culture it presented the same appearance as the latter, but cross-inoculation experiments with the two organisms and *Phytomonas campestris* [*Bacterium campestre*] var. *armoraciae* [ibid., viii, p. 543] showed the three to be distinct pathologically, each producing infection on its own host but slight or none on the others.

JACOBS (S. E.). **Brown heart disease in Turnips.**—*Gdnrs' Chron.*, Ser. 3, cix, 2827, p. 91, 1 fig., 1941.

Attention is drawn to the occurrence of brown heart in substantial amounts in a turnip crop on an allotment at Morden, Surrey, this being the first record of the disease in the home counties, though it is becoming widespread elsewhere in Great Britain [*R.A.M.*, xv, p. 416]. The symptoms of the disorder are briefly described and recommendations made for its control by the application to the soil, shortly before sowing, of borax at the rate of 20 lb. per acre (approximately 6½ oz. per 100 sq. yds.).

GRIES (H.). **Quantitative determination of blackleg in Sugar Beets and the efficiency of seed disinfectants.**—*Z. WirtschGr. Zuckerindust.*, xc, [3], pp. 197–206, [1940. German. Abs. in *Facts ab. Sug.*, xxxvi, 3, p. 33, 1941.]

The writer has devised a reliable method, hitherto lacking, for the determination of the relative utility of the different fungicides used against black leg of sugar beet. In one plot the germination of untreated seed is determined in sterilized soil, and in another the treated lot is planted in the same soil inoculated with the spores of *Pythium* [*? de Baryanum*]. The results are evaluated on the following basis. The germination test shows the number of seedlings to be expected in the absence of attack by soil fungi. In the infected soil the number of healthy seedlings, expressed as a percentage of the germination in sterile soil, gives the percentage efficiency of the treatment. The total count of diseased and healthy seedlings in the inoculated soil is seldom or never equal to the stand in sterile ground, since some of the germinating seeds are killed by *P.* (?) *de Baryanum* before emergence. It would thus be erroneous to figure the diseased plants as a percentage of the total number counted; the germination test must be made to provide the real basis for calculation. Investigations by this method have demonstrated the efficacy of dusts for the control of *P.* (?) *de Baryanum* and *Aphanomyces* [*levis*: *R.A.M.*, xv, p. 763].

LeClerg (E. L.). **Comparative studies of Sugar-Beet and Potato isolates of Rhizoctonia solani.**—*Phytopathology*, xxxi, 3, pp. 274–278, 1941.

In comparative studies of the morphology, physiology, and pathogenicity of ten isolates of each of four groups of *Rhizoctonia* [*Corticium*] *solani*, from sugar beet, stem lesions on older potato plants, stolon lesions, and tuber sclerotia [*R.A.M.*, xx, p. 175], four from potato stem lesions and six from sclerotia did not differ significantly in hyphal diameters, but nine of those from sugar beet were appreciably smaller (7·8 to 9μ) than any of the potato strains (9·2 to 11·4μ). The sugar beet isolates grew more rapidly on potato dextrose and high nitrogen agars (the latter prepared according to F. A. Heck's formula in *Soil Sci.*, xxvii, pp. 1–48, 1929) than any of those from potato. The optimum temperature for the growth of the isolates from the mature potato plant, stolons (excepting those able to cause dry rot canker of beets), and sclerotia was 25° C. or below, whereas 19 out of 20 sugar beet strains and those from stolon lesions capable of inducing beet canker throve best at 30°. As a group, the sugar beet isolates of *C. solani* caused a higher percentage of damping-off in sugar beets, beans [*Phaseolus vulgaris*], peas, and cabbage than any of three groups from potato, the percentages of emergence in the four hosts infected by the sugar beet strains being only 9, 27, 13, and 28, respectively, compared with 74, 84, 63, and 69, respectively, for those infected by strains from potato stolon lesions; 82, 91, 70, and 70, respectively, for the stem lesion isolates; and 82, 92, 80, and 72, respectively, for those from sclerotia.

Green (D. E.). **Hygiene in the war-time vegetable garden. IV.**—*J.R. hort. Soc.*, lxvi, 4, pp. 130–136, 6 figs. (facing p. xxxiii), 1941.

Continuing his series of directions for the control of vegetable diseases in war-time allotments [*R.A.M.*, xx, p. 238], the author deals with some well-known pathogens of broad, dwarf, and runner beans, and celery.

Stellwaag (F.). **Forschungsaufgaben des weinbaulichen Pflanzenschutzes.** [Research problems confronting viticultural plant protection.]—*Forschungsdienst*, xi, 2, pp. 153–160, 1941.

Among the most urgent problems awaiting solution in the sphere of viticultural plant protection in Germany are the following: (1) those connected with various aspects of the control of downy mildew (*Peronospora*) [*Plasmopara viticola*], including improvements in the accuracy of forecasting outbreaks by means of the incubation calendar [*R.A.M.*, xix, p. 325]; (2) chlorosis, found on a recent tour of inspection to have been accentuated to such a degree by the cumulative rains of 1939 and 1940 as to entail complete loss of productivity in vines covering an area of 5,000 ha.: the detection of spots on the wood of affected American varieties may be a sign of parasitic intervention in the development of this trouble; and (3) the numerous forms of true and spurious degeneration, the former comprising mosaic and possibly the 'reisig' and 'roller' diseases [ibid., xviii, p. 652], and the latter associated, *inter alia*, with adverse environmental conditions and pathogenic agents.

Peronóspora en los viñedos. [Peronospora in the vineyards.]—*Bol. agríc., Mendoza*, viii, 10–12, pp. 275–276, 1940.

The attention of viticulturists is drawn to the appearance in certain districts of Mendoza, Argentine Republic, of vine downy mildew (*Peronospora*) [*Plasmopara viticola*], immediate steps to prevent the spread of which should be taken by treatment with 1·5 per cent. Bordeaux mixture.

Lindfors (T.) & Holmberg (C.). **Växtsjukdomar i Sverige 1933–37.** [Plant diseases in Sweden 1933–1937.]—*Medd. Växtskyddsanst., Stockh.*, 33, 131 pp., 3 figs., 4 maps, 1941.

This is a valuable fully documented survey of the plant diseases recorded among agricultural and horticultural crops in Sweden from 1937 to 1940.

[Waterston (J. M.).] **Plant pathology.**—*Rep. Dep. Agric. Bermuda, 1940*, pp. 6–8, 1941.

In this report [cf. *R.A.M.*, xix, p. 517] it is stated that owing to heavy virus infection of seed potatoes from Long Island in recent years, an attempt was made to grow equally good seed potatoes locally. Bliss Triumph seed from Nova Scotia was planted in February, and as the plants grew they were inspected for virus attack, and the diseased ones removed. The potatoes were dug towards the end of May, and placed in cold storage until September, when they were planted. The resulting crop proved to be conspicuously free from disease, only 3·7 of the plants showing leaf roll. Seed from fields not rogued showed 17 per cent. infection, and seed from Long Island 40 per cent. The yield from the Bermuda-grown seed was much in excess of that from the imported.

Interesting disease records made during the year included a rot of the sterile flowers and fruit of Cavendish banana due to *Sclerotinia sclerotiorum*, a leaf spot of guava due to *Gloeosporium psidii*, grapefruit scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*], and peach leaf curl (*Taphrina deformans*). Diseases recorded for the first time locally were sorghum smut (*Sphacelotheca sorghi*) and groundnut leaf spot (*Cercospora personata*). A decay of cassava tubers was caused by *Diplodia* [*Botryodiplodia*] *theobromae* [ibid., xv, p. 278].

Reed (G. M.). **Reports on research for 1940. Plant pathology.**—*Rep. Brooklyn bot. Gdn, 1940* (*Brooklyn bot. Gdn Rec.*, xxx, 2), pp. 81–93, 1941.

Many additional F_3 progenies of a hybrid between Navarro and Hull-less oats were grown during the period under review, 225 being inoculated with race 12 of loose smut [*Ustilago avenae*] and 226 with race 7 of covered smut [*U. kolleri*: *R.A.M.*, xix, p. 526]. The inheritance of resistance to covered smut (races 3 and 7, the former used in last year's tests) was shown to depend on three factors. The results obtained in the loose smut experiments differed materially both from those secured with race 1 [loc. cit.] and from the outcome of the covered smut tests. Relatively few of the progenies were resistant, and many proved to be highly susceptible.

Most of the 40 collections resulting from L. G. Utter's hybridization of races 1 of *U. avenae* and *U. kolleri* [ibid., xix, p. 527] produced heavy infection on the Gothland variety, normally resistant to the latter though very susceptible to the former, and on Monarch, in which the reactions are normally the opposite of the foregoing. Gothland and Early Champion were susceptible to all 15 of the covered smut races now established, while Monarch was resistant to 11 of them and Fulghum and Joanette to all. Eight of the nine known races of *U. avenae* were highly pathogenic to Monarch, while Gothland was susceptible to six. Green Mountain and Early Champion, susceptible to race 1 of *U. avenae*, were resistant to all the hybrid races, while Fulghum and Joanette, resistant to race 1 of *U. avenae*, were susceptible to all the hybrids.

Previous investigations by D. Elizabeth Marcy had shown the contributory influence of conditions retarding the growth of sorghum seedlings on susceptibility to covered smut [*Sphacelotheca sorghi*: loc. cit.]. Stunting by removal of part of the seed endosperm before inoculation and planting entails somewhat heavy mortality in the susceptible Dakota Amber Sorgo varieties, but all the surviving plants became infected, compared with 94 and 97 per cent. in the series with the endosperm left intact. In the case of Red Amber Sorgo, 49 per cent. of the seedlings subjected to partial endosperm removal were smutted compared with 31 per cent. of the intact series. Endosperm removal also appeared to promote the peculiar type of infection in Feterita known as 'blasting' (29 per cent. as against 18 in the intact series). Pre-soaking of the seed for 48 hours, especially with frequent changes of water, was found to be conducive to infection both by covered and loose smut [*S. cruenta*], Red Amber Sorgo, for instance, contracting 73 per cent. infection by *S. sorghi* after this treatment as compared with 66 per cent. for the controls, the corresponding figures for Dawn Kafir being 95 and 56 per cent., respectively; Milo, which normally seldom produces a smutted plant, developed a low percentage of infection following pre-soaking.

Plant pathology.—*Rep. Ariz. agric. Exp. Sta., 1939–40*, pp. 90–102, 6 figs., 1 graph, 1941. [Mimeographed.]

In the course of extensive field experiments during the period under review [cf. *R.A.M.*, xvii, p. 503], complete control of angular leaf spot of cotton [*Xanthomonas malvacearum*] was secured by delinting with [sulphuric] acid, with or without the added precaution of dusting with ceresan. A few diseased plants occurred among the stands raised from fuzzy ceresan-treated seed, while untreated material gave rise to infection ranging from a trace to semi-complete. The early disappearance (by 20th July) of the disease from primarily infected seedlings in most of the fields under observation is presumed to have been due to the exceptionally dry conditions prevailing during the season.

Verticillium wilt of cotton behaved in a very erratic manner, the Acala crop in some heavily infected fields suffering little or not at all, while in others up to 50 per cent. reduction in yield resulted, suggesting the existence of strains of varying degrees of virulence.

Sclerotium rolfsii [ibid., xviii, p. 25], hitherto unknown in a severe

form in Arizona cotton fields, caused a sudden wilt and death of the plants, leaving extensive gaps in the stands. Decaying cotton stalks in the soil, ploughed under from the preceding season, constitute one source of infection.

During the three-year period from 1937 to 1939, a total of 1,636 out of 6,800 (24 per cent.) pecan trees 6 to 20 years old, in five 80-acre orchard plots subjected to various kinds of intercropping and soil treatments, contracted infection by *Phymatotrichum omnivorum* [ibid., xvii, p. 504]. Most of the treatments consisted of combinations of ammonium sulphate or ammonium phosphate and agricultural sulphur at a basic rate of 1 lb. of each chemical per 10 sq. ft. root area, followed by a 4-in. irrigation. In the four treated plots only 1·5 per cent. of the trees died compared with 10·6 per cent. in the untreated control area. The small number of new infections and trees dying from June to November, 1939, in three of the treated plots (5, 21, and 16, and 1, 3, and 3, respectively), indicate that the root rot is under control in these orchards. A 10-acre plot in a severely infected, untreated grove intercropped with lucerne in 1937 and 1938 contained 4·4 per cent. dead trees in June, 1937; 2½ years later, 29·5 per cent. more trees had succumbed and 37 per cent. were infected, leaving only 29 per cent. apparently sound.

English seed peas treated against damping-off of miscellaneous fungal origin with new improved ceresan, cuprocide, vasco 4, or semesan produced percentage stands of 35, 55, 38, and 45, respectively, compared with 23 for the untreated controls, the corresponding figures for sugar beet being 45, 48, 49, 48, and 23, respectively.

Tomato yellows [curly top], the virus of which is carried by the beet leafhopper [*Eutettix tenellus*: ibid., xx, p. 37], is the most serious disease of the crop in the State. Details are given of experiments involving the protection of plants of the Earliana, Valiant, and Rutgers varieties by cheesecloth tents from transplanting on 23rd May until 10th June or harvest time, the results of which showed that the disease may be effectively combated by this means, the longer period of covering being preferable. The unprotected control plants were mostly (81·4 per cent.) dead by 1st August. The cost of the cheesecloth amounted to 2½ cents per plant.

The one citrus disease of commercial importance in Arizona is dry root rot, a severe outbreak of which in a 7-acre grove of Valencia oranges in the autumn of 1939 resulted in the death of 52 trees, another 22 being definitely infected and a further 32 under suspicion. Most of the trees treated in December with the chemical combinations found effective against *P. omnivorum*, as described above, responded favourably. A number of trees grafted on rough lemon stocks remained free from root rot.

A new bud rot of *Canna* is attributed to *Phytomonas* [*Pseudomonas*] *cannae*. *Washingtonia gracilis*, resistant to the bud rot caused by *Phytophthora palmivora*, should be substituted for *W. filifera* in the Salt River Valley, where the disease is destructive.

Symptoms of bacterial necrosis of the giant cactus (*Carnegiea gigantea*) [ibid., xx, p. 210] are circular, pale spots with water-soaked margins on the trunk and branches, the underlying tissues turning

brown to black and decaying, a dark, watery exudation being typical of cases of rapid infection; in the final stages, the 'flesh' falls away, leaving a bare framework, unless the weakened trunk has already been broken off by wind. In dense plantings, a weakened tree may lean against a healthy one and infect it. Decayed spots should be excised in the incipient phase and the resultant wounds disinfected and coated with a water-soluble asphalt paint, badly diseased and fallen trees being destroyed.

WINTER (A. G.). **Ein neuer Fußkrankheitserreger an Weizen, Gerste, Roggen und Hafer (Colletotrichum graminicolum [Ces.] Wilson).** [A new foot rot pathogen on Wheat, Barley, Rye, and Oats (*Colletotrichum graminicolum* [Ces.] Wilson).]—*Phytopath. Z.*, xiii, 3, pp. 282–292, 9 figs., 1940.

A foot rot new to Germany was observed to occur on wheat, rye, barley, and oats in the experimental fields of the Phytopathological Institute of Bonn University in 1938, without causing significant losses. A fungus isolated from sclerotia found on lesions was proved to be the causal agent of the disease by inoculation. The sclerotia occurred in tissues of the leaf sheath, stem, and roots. No fructifications were found, but the fungus is believed to be specifically identical with *Colletotrichum graminicola* described by Sandford [*R.A.M.*, xiv, p. 574] on oats, although since the host range is different and sclerotial formation occurs on the roots of seedlings the author assumes that different forms or races of the fungus are involved.

TRAYLOR (J. A.). **Hyperparasites attacking rust fungi in Oklahoma.**—*Proc. Okla. Acad. Sci.*, xx, pp. 57–58, 1940.

Darluca filum [*R.A.M.*, xix, p. 730] has been found in Oklahoma parasitizing *Puccinia amphigena* on *Calamovilfa gigantea*, *Uromyces graminicola* on *Panicum virgatum* [ibid., xx, p. 264], *U. peckianus* on *Aristida oligantha*, and *U. lespedezae* on *Lespedeza* [ibid., xiv, p. 516]. The setae supposedly typical of *D. filum* spores were largely absent in the local collections and are apparently not a constant character of the species. *D. filum* was transferred from *U. graminicola* to *Puccinia triticina* on wheat, the pycnidia of the hyperparasite developing on the inoculated rust sori in six days at a mean temperature of 65° F. *D. filum* was obtained from only one out of 300 wheat leaf rust samples collected in the State, but developed in profusion on *P. triticina* in a greenhouse epidemic in 1939 under conditions favouring the growth both of the wheat plants and their pathogen.

ROBBINS (W. J.). **Biotin and the growth of Fusarium avenaceum.**—*Science*, N.S., xciii, 2419, pp. 437–438, 1941.

A strain of *Fusarium avenaceum* obtained from South Africa was found not to grow on a solution of mineral salts and sugar, but to grow on the same solution solidified with agar. The beneficial effect of agar is ascribed chiefly to the action of biotin; when the biotin was extracted from the agar, the growth-promoting effect ceased. The amount of biotin present varied with the samples of agar, amounting to approximately 0·1 microgram per gram in some. Even 0·001 microgram of

pure biotin had a beneficial effect on the growth of the fungus in liquid culture, and amounts up to 0·1 microgram per culture further increased the dry weight. Some isolations made from old cultures of the organism grew in the absence of biotin; these are considered to be saltations or dissociations.

DÉFAGO (G.). **Effets de l'aneurine, de ses composants et de l'hétéro-auxine sur la croissance de trois parasites du Blé.** [The effects of aneurin, of its constituents, and of hetero-auxin on the growth of three Wheat parasites.]—*Phytopath. Z.*, xiii, 3, pp. 293–315, 5 figs., 1940.

This is an expanded account of the author's preliminary paper describing experiments on the effect of aneurin on *Tilletia tritici* [*T. caries*], *Cercosporella herpotrichoides*, and *Ophiobolus herpotrichus*, with particular reference to the parasitism of these fungi [*R.A.M.*, xix, p. 649].

The results obtained with *T. caries* showed that the whole aneurin molecule was necessary for the growth of the fungus. The two constituents of aneurin, pyrimidin and thiazol [cf. ibid., xix, p. 723], were unable to replace aneurin in this respect, either separately or together. Hetero-auxin [indole-acetic acid] began to be harmful to the growth of *T. caries* at a concentration as low as $4 \cdot 10^{-10}$. Gelose reduced this effect, and very low concentrations of the hetero-auxin favoured growth. Aneurin had no effect on chlamydospore germination, but markedly stimulated the growth of the promycelium. In the dosages tested the hetero-auxin inhibited chlamydospore germination.

The experiments with *C. herpotrichoides* showed that its sensitiveness to hetero-auxin was somewhat less marked than that of *T. caries*, the lethal concentration being $4 \cdot 10^{-6}$.

O. herpotrichus showed almost complete auxo-autotrophy towards aneurin, and a weaker sensitiveness to hetero-auxin.

It is concluded that aneurin has indirectly an influence on the susceptibility and resistance of wheat to bunt. Hetero-auxin and perhaps the natural auxins are probably factors in passive resistance. Hyperproduction of auxin under the influence of the parasite is probably a form of active resistance, of local, histological immunity.

ZAZHURILO (V. K.) & SITNIKOVA (Mme G. M.). **Natural ways of transmission of the Winter Wheat mosaic virus.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxix, 5–6, pp. 429–432, 1940.

In winter wheat crops in the province of Voronezh, U.S.S.R., the symptoms of mosaic [*R.A.M.*, xx, p. 157] were observed during the period of the writers' observations from 1935 to 1939 to appear in the autumn, over 10 per cent. infection being present by the winter in seasons when a warm, damp spell supervenes after the harvest. The next year the proportion of diseased plants increases considerably through latent infection, showing that the virus overwinters in the invaded stands.

Early sowing was found to predispose wheat crops to mosaic, the incidence in stands sown on 1st, 5th, and 10th September, 1938, being 13·8, 5·8, and 5·4 per cent., respectively. On the other hand, spring

oats planted on 5th May, 1938, were more severely affected (10 per cent.) than those sown on 24th April (3·6).

Studies on the life-cycle of the insect vector (*Deltocephalus striatus*) of the wheat mosaic virus in relation to the phenology of the host pointed to the third generation, hatched in the autumn, as the principal agent of infection: it develops mainly among the stubble of late spring crops and on plots overgrown with cereal weeds, such as *Setaria viridis* and *S. glauca*. The critical period for the infection of the winter crop thus extends from the germination of the seed in the autumn until the advent of persistent frosts. On the other hand, the first (spring) generation of the insect is the only one of any importance in the infection of spring crops (oats in these experiments). Control measures should be based on cultural practices tending to reduce the incidence of infection on winter crops (the chief sufferers from the disease), e.g., early ploughing of fallow ground, eradication of weeds, and destruction of 'volunteer' plants, which constitute an important link in the developmental cycle of mosaic. The attention of plant-breeders should be directed in the first instance towards the establishment of resistance in winter varieties, after which the freedom of the spring crops from disease will follow automatically.

Tyner (L. E.). **Some factors affecting the virulence of artificial inoculum of Helminthosporium sativum P. K. and B. and of Fusarium culmorum (W. G. Sm.) Sacc.**—*Canad. J. Res.*, Sect. C, xix, pp. 42–48, 1941.

In greenhouse experiments in Alberta, steam-sterilized black loam soil mixed with various amounts of maize meal was inoculated with spore suspensions of *Helminthosporium sativum* and *Fusarium culmorum* [*R.A.M.*, xix, p. 649]. When this inoculum was applied to grain sown in sterilized and unsterilized soil, the amount of maize meal added to the medium and the period of incubation caused significant differences in the number and dried weight of surviving wheat plants and weighted infection ratings. Inocula of either organism containing 12 per cent. maize meal were more pathogenic than those containing 5 per cent. Inoculum of *H. sativum* incubated for 14 days was considerably more pathogenic than that incubated for 21, 28, or 35, but with *F. culmorum* the age of the inoculum did not seem to exert any effect. The size of the flask in which the inoculum was incubated was of little importance if desiccation was avoided. These data are taken to indicate that in order to prevent organic matter in the inoculum from causing increased virulence of the fungi in soil, the amount of carbohydrate added should be the minimum commensurate with good growth of the pathogen. The importance of standardized technique in the preparation of media for the culture of the soil-inhabiting fungi used as inocula, is stressed.

Saboe (L. C.) & Hayes (H. K.). **Genetic studies of reactions to smut and of firing in Maize by means of chromosomal translocations.**—*J. Amer. Soc. Agron.*, xxxiii, 5, pp. 463–470, 1941.

At the Minnesota Agricultural Experiment Station from 1937 to 1939, F_1 crosses between smut (*Ustilago zeae*)-susceptible interchange lines of maize and two resistant inbred lines derived from Rustler and

Minnesota No. 13 were back-crossed to the resistant inbred parents, and a study was made of the linkage relations between chromosomal translocation and smut reaction in the resultant progeny [*R.A.M.*, xix, p. 273].

Significant associations between smut reaction and point of translocation were observed in interchanges 3 to 7*b*, 5 to 7*d*, 6 to 9*a*, and 8 to 10*a* in the crosses with the inbred line of Minnesota No. 13, and in 1 to 4*a*, 3 to 5*c*, and 5 to 8*a* in the Rustler crosses. The Minnesota No. 13 crosses yielded indications that at least three factor pairs or linked groups of factors are responsible for the reaction to *U. zeae*, one possibly located in the long arm of chromosome 7, one in the short arm of chromosome 6, and one in the long arm of chromosome 8. In the Rustler crosses the smut reaction appears to depend on at least two, perhaps three, factor pairs or linked groups of factors, located, respectively, in the short arm of chromosome 4, either in the long arm of chromosome 3 or in that of chromosome 5, and either in the long arm of chromosome 8 or somewhere in chromosome 5. The location of factors for smut resistance in the Rustler and Minnesota No. 13 inbreds appears to be somewhat different.

Gassner (G.). **Untersuchungen über das 'Mal secco' oder 'Kurutan' der Limonbäume.** [Investigations into the 'mal secco' or 'kurutan' of Lemon trees.]—*Phytopath. Z.*, xiii, 1, pp. 1–90, 48 figs., 1 graph, 1 map, 1940.

The 'mal secco' disease of citrus [*R.A.M.*, xv, p. 575] is stated to be generally distributed along the whole Mediterranean coast of Turkey, attacking mainly and seriously lemon, but also young sour orange and *Citrus medica* trees, while older sour orange trees are highly resistant, and sweet oranges almost, and tangerines entirely, immune. The causal fungus, *Deuterophoma tracheiphila* [loc. cit.], the pathogenicity of which was proved by artificial infection, is very probably identical with *Phoma limoni* von Thümen. It was established that symptoms such as vessel infiltrations and disturbances in the cambium zone, which have commonly been ascribed to 'mal secco', are actually due to frost injury. In the primary stage of 'mal secco', which extends from January to April, the disease spreads from the tips of the branches towards the base. During the summer progress in development is slow, but in October the latent mycelium spreads into the healthy parts and eventually kills the tree within a few months. The infection is believed to originate in tips injured by frost. This explains the fact that considerably larger numbers of new infections can be observed after severe winters than after mild ones, when they are often altogether absent. It also accounts for the greater susceptibility of the frost-sensitive lemon to the disease. Among Turkish lemon varieties, Molla Mehmed was found to be fairly resistant to 'mal secco' and in possession of all those physiological characteristics which ensure a low frost sensitivity.

Gassner (G.). **Untersuchungen über das Citrus-Sterben von Dörtyol oder die Gelbnervigkeit der Citrusbäume.** [Investigations on the dying-off of Citrus in Dörtyol or the vein-yellowing of Citrus trees.] —*Phytopath. Z.*, xiii, 2, pp. 97–125, 31 figs., 1940.

Observations started in the winter of 1934 showed that about 60 to

70 per cent. (or roughly 100,000) of the citrus trees growing in the Dörtyol district of Turkey, where the cultivation of this fruit is practised on a commercial scale, suffered from a disease characterized by vein-yellowing of the leaves and, in advanced stages, by bark decay and rot at the collar and lower part of the stem. The name 'brown root gummosis and foot rot' [*R.A.M.*, xv, p. 575] is commonly used for these secondary symptoms, but the author considers the primary symptoms as more characteristic and accordingly proposes the term 'Gelbnervigkeit' [vein-yellowing] instead. The yellowing first affects the main vein, then the lateral veins of the leaf, and later the whole lamina becomes discoloured. It is easily distinguishable from mottle leaf, in which the veins remain green longest, but both diseases may occur simultaneously on the same tree.

Deep planting and subsequent earthing-up is considered to be the primary cause of the disease, with bark rot due to attack of the weakened lower part of the stem by *Phytophthora* spp. as a secondary development. The fungi are, therefore, of no importance in spreading the disease. The opinion that the disease is due to an interrupted sap movement caused by deep planting was supported by field observations of over 100 cases in which diseased leaves were invariably found to have an injured main vein (mechanical injury brought about by wind or hail). The part of the leaf above the injury showed yellowing, whereas that below was normally green; the same development was observed in young citrus trees damaged by animals. Experimental injury to the main vein of leaves resulted in the development of symptoms fully agreeing with those observed in the field. It is concluded that the interruption of the rising sap flow and the subsequent blockage of assimilates is responsible for the disease. Although deep planting is also practised with other fruit trees in this district, vein-yellowing was exhibited by citrus foliage only.

The large-scale control campaign carried out during the winter of 1938 met with complete success. Trees in the early stages of disease recovered rapidly when the collar was laid open, both bark and leaves regaining their normal colour; trees in the later stages with bark affected by decay needed more time to recover, but eventually the bark healed by forming callus. Negative results were obtained only with trees in very advanced stages, when almost the entire bark of the lower part of the stem had been destroyed. Attempts to control the disease by uncovering the collar were made by several citrus-growers in 1935 with similar success. For the future it is recommended that deep planting of young trees and the practice of covering up with earth the lower part of the stem be avoided. The application of fungicides is considered superfluous.

Biale (J. B.) & Shepherd (A. D.). **Respiration of Citrus fruits in relation to metabolism of fungi. I. Effects of emanations of Penicillium digitatum Sacc. on Lemons.**—*Amer. J. Bot.*, xxviii, 4, pp. 263–270, 2 figs., 1941.

The exposure of freshly picked green lemons under strictly controlled conditions at 14·5° C. to vapours from mouldy fruit inoculated with *Penicillium digitatum* [*R.A.M.*, xix, p. 470], resulted in a very marked

increase (up to 97 per cent.) in the rate of respiration and a definite acceleration in the colour development of the fruit. A single mouldy fruit was capable of producing an 80 per cent. increase in the carbon dioxide production of 500 normal lemons. The formation of the active vapour by the fungus was apparently not increased by raising the temperature to 20° or 25°, but it was inhibited at 2·5°. Similar general results were obtained when cultures of *P. digitatum* on a dextrose-potato broth agar medium were used instead of the mouldy fruit. Tests with pea seedlings indicate that epinasty is induced by emanations of this fungus.

Bocharova (Mme Z. Z.). **Diseases of Citrus fruit in storage. I. Botrytis cinerea on stored Citrus fruit.**—*Microbiology*, viii, pp. 1187–1193, 1940. [Russian, with English summary. Abs. in *Chem. Abstr.*, xxxv, 10, p. 3351, 1941.]

Temperature reduction was found merely to restrict the proteolytic activity of *Botrytis cinerea* on stored citrus fruits in the U.S.S.R. [*R.A.M.*, xviii, p. 671], the mould being capable of development at −5° C. The disease is controllable by selection and careful packing of the fruit. Spanish oranges and Italian lemons held under refrigeration were almost completely resistant to infection.

Fawcett (H. S.). **Adventures in the plant-disease world.**—34 pp., 10 figs., 1 diag., 1 graph, Berkeley, Univ. Calif. Press, 1941. 50 cents.

In this lecture the author vividly describes in popular language some of the more striking aspects of his studies on certain diseases affecting the citrus crops of the United States.

Bitancourt (A. A.). **A podridão das radicelas dos Citrus na provincia de Corrientes, Argentina.**—*Biologico*, vi, 10, pp. 285–288; 12, pp. 356–364, 8 figs., 1 map, 1940; vii, 3, pp. 62–69, 1941.

This is a comprehensive account of the root rot ('Bella Vista disease') of citrus in the province of Corrientes, Argentine Republic [*R.A.M.*, xv, p. 716], embodying the observations made and conclusions reached by the author and H. S. Fawcett during a tour of inspection of the affected areas in 1937. Hitherto the only species attacked are the sweet orange, tangerine, and possibly pomelo grafted on sour orange stocks. The various theories advanced in explanation of the disease are discussed: those involving physiological causes or incompatibility between stock and scion may in all probability be rejected, while the part played by fungi (notably *Colletotrichum gloeosporioides*) appears to be purely secondary; the activity of a graft-transmissible virus, occurring in a virulent form in the sweet orange and latent in the sour, is considered to afford the most plausible hypothesis.

Fawcett (H. S.) & Bitancourt (A. A.). **Occurrence, pathogenicity, and temperature relations of Phytophthora species on Citrus in Brazil and other South American countries.**—*Arq. Inst. biol. S. Paulo*, xi, 15, pp. 107–118, 3 pl., 1940. [Portuguese summary.]

Five species of *Phytophthora* have so far been isolated and identified from citrus in South America, viz., *P. citrophthora* (three localities in

Brazil and three in the Argentine) [*R.A.M.*, xix, p. 341]; *P. parasitica* (seven in Brazil [ibid., xix, p. 521], two in the Argentine, and one in Paraguay); *P. cactorum* (two in Brazil and one in the Argentine); *P. palmivora* (one in the Argentine, one in Uruguay, and one in Surinam); and *P. cinnamomi* (one in Brazil): this is believed to be the first record of the last-named species on citrus in any country, and it is the only *Phytophthora* causing the development of comparatively extensive lesions on sour orange. Assuming *P. citricola* to be identical with *P. cactorum*, this species under the former name has been previously isolated only in Japan [ibid., xv, p. 57] and South Africa. The isolations of *P. citrophthora* were obtained from grapefruit, sweet and sour orange, and sweet lime; of *P. cactorum* and *P. parasitica* from lemon and orange; and of *P. palmivora* from orange and tangerine.

In general, the results of inoculations into the wounded bark with *P. citrophthora* agreed with those obtained by Klotz and Fawcett in California [ibid., x, p. 98], the largest lesions developing on lemon and sweet lime, those on grapefruit, orange, and Rangpur lime being smaller, while tangerines exhibited spots of much smaller dimensions. The results of artificial infection with *P. cactorum* approximated to the foregoing, except that the lesions were generally smaller. There was less difference between the size of the spots on lemons and oranges resulting from inoculation with *P. parasitica* than in the case of the other two species used in the tests. In experiments with the same three pathogens on uninjured fruits *P. citrophthora* induced decay of all the lemons (5 or 6), oranges (3), and grapefruits (1) inoculated, while *P. cactorum* and *P. parasitica* caused rotting in only one and two or three fruits, respectively, the characteristic odour of putrescence also being most noticeable in the case of the first-named.

In tests to determine the growth relations of four of the five species (excluding *P. palmivora*) at seven different temperatures ranging from 5° to 35° C., *P. citrophthora* attained its maximum development at 24° and next at 28°, and *P. cactorum* at 28° and next at 24°; both grew slowly at 10·5° and remained stationary at 5° or 35° (the latter also at 31°). The best growth for *P. cinnamomi* was attained at 31°, closely approached by that at 28°; no growth occurred at 5°, 10·5°, or 35°. V. A. Wager in South Africa (*in litt.*, 1939) obtained results comparable to those of the writers in his subsequent experiments with transfers of the same isolates of *P. cactorum* and *P. cinnamomi*. In a test by Wager with *P. palmivora* (Argentine) the growth range extended from 13° to 37°, but the best results were obtained at 25°.

Krug (H.). **Cafés duros. IV. Relação entre zonas, qualidade de Café e porcentagem de microorganismos.** [Hard Coffees. IV. Relation between localities, quality of Coffee, and percentage of micro-organisms.]—*Rev. Inst. Café, S. Paulo*, xvi, 169, pp. 288–295, 1 map, 1941. [English summary.]

In connexion with his studies on the relation of infection by micro-organisms to inferiority in the quality of coffee berries in São Paulo, Brazil [*R.A.M.*, xx, p. 256], the writer in 1940 made several tours of inspection of the coffee-growing regions of the State, in the course of which samples of red berries and dry fruit from the tree and from the

ground were collected and brought to the Campinas Technical Institute for study. For practical purposes, though regions of intermediate gradation do exist, the State can be divided into zones of high- and low-grade coffee production, the former including Tapiratiba, Mocóca, Batatais, Ribeirão Preto, and Franca, in which the maximum percentages recorded in any locality of *Fusarium concolor*, other fungi (notably *Cladosporium* and *Penicillium* spp.), and bacteria were 18, 31, and 3, respectively, and the latter Pindorama, Rio Preto, Valparaiso, Ipaussú, and Ourinhos, with corresponding maxima of 44, 70, and 16, respectively.

Silberschmidt (K.). **A transmissão experimental da 'mancha anular' do Cafeeiro.** [The experimental transmission of Coffee 'ring spot'.] —*Biologico*, vii, 4, pp. 93–99, 2 pl., 1 fig., 1941. [English summary.]

Experiments were conducted on a large scale in São Paulo, Brazil, to determine the conditions governing the transmission of the 'ring spot' of coffee [*R.A.M.*, xviii, p. 452] to the same host and two other locally widespread members of the Rubiaceae, *Borreria poaya* and *Richardsonia brasiliensis*. Negative results were given by attempts to transmit the virus from diseased to healthy plants by way of the seed or sap, but the approach- and side-grafting of healthy scions on severely diseased stocks induced the development of ring spot symptoms after a minimum period of ten months. In this respect the coffee disease resembles infectious chlorosis of the Malvaceae, while its symptoms are comparable to those of tobacco ring spot and citrus leprosis.

Progress Reports from Experiment Stations, season 1939–40.—vi+176 pp., London, Empire Cotton Growing Corporation, 1941.

These reports [cf. *R.A.M.*, xix, p. 532] contain, *inter alia*, the following items of interest. In Swaziland regular counts of cotton seedlings affected with angular leaf spot [*Xanthomonas malvacearum*] showed that seed disinfection gave good control, the untreated plots at thinning time having 30 per cent. infection, as against only 3 and under 1 per cent. for the plots treated with abavit and sulphuric acid, respectively. Two weeks later, infection in the untreated plots reached 85 per cent., while increase was negligible in the treated ones.

The season was moderately wet in Southern Rhodesia and as it succeeded one of the wettest recorded, angular leaf spot was unusually common. Locally, it is not regarded as serious, since it seldom develops beyond the primary stage. In 1940, however, infection reached the blackarm stage.

Further trials in Uganda confirmed the resistance of the B. 181 group of cotton varieties and the susceptibility of the B.P. 50 groups to wilt diseases, including those due to *Fusarium* [spp.] and *Verticillium* [*dahliae*: ibid., xix, p. 533], which are indistinguishable from each other in the field; B.P. 52 appears to come midway between these two groups in respect of resistance. P.P. 52 and Local gave conflicting results in different localities. It would appear that plants showing only internal symptoms of wilt suffer no appreciable reduction of crop, whereas those betraying external signs of the condition give a greatly diminished yield or may even be killed. The B. 181 groups possess very high

resistance to the external type but relatively low resistance to the internal. It is pointed out that it is difficult to assess the degree of attack by blackarm when plant size varies much. In the period under review, S.G. 29 was very stunted, whereas N. 17. M2 attained more vigorous growth than any other variety. As a result, N. 17. M2 was debited with a high lesion count, although it showed less severe infection than S.G. 29.

In Tanganyika Territory the cotton was attacked here and there by *Ramularia areola* [*Cercosporella gossypii*: ibid., xviii, p. 575] but without apparent loss. Confirmation was obtained that staining of cotton in Nyasaland was due to *Nematospora gossypii*, and not to *X. malvacearum*.

Rigler (N. E.) & Greathouse (G. A.). **Fungicidal potency of quinoline homologs and derivatives.**—*Indust. Engng Chem.*, xxxiii, 5, pp. 693–694, 1941.

The fungicidal potencies of isoquinoline, 13 quinoline homologues, 2- and 8-hydroxyquinoline, a nitrogen base $C_{16}H_{25}N$, and five fractions of bases from transformer-oil extract were determined against the cotton root rot fungus, *Phymatotrichum omnivorum*, at the Texas Agricultural Experiment Station [*R.A.M.*, xix, p. 592]. All the homologues were more strongly fungicidal than quinoline itself, and a tendency was apparent for toxicity to increase with molecular weight. Of the five methyl compounds tested, 6-methylquinoline was the most powerful, followed by 4-, 7-, 2-, and 8-methylquinoline, respectively. The 2, 6-dimethylquinoline was more inhibitory than the 2, 4-dimethyl compound, indicating that a substituent at position 6 is more toxic than one at 4. Of the 2, 3-dimethyl-8-alkyl compounds, the ethyl was the most, and the methyl the least toxic, the propyl being intermediate.

Of the five nitrogen bases from transformer-oil extract, the four most strongly fungicidal fractions were aromatic, the degree of toxicity increasing with the boiling-point and therefore with molecular weight. Even the least potent fraction was equally fungicidal with the most potent quinoline. The single non-aromatic fraction was slightly more toxic than the $C_{16}H_{25}N$ base.

The effect of the hydroxyl group and its position was determined by comparing 8- and 2-hydroxyquinoline, the former completely inhibiting the growth of *P. omnivorum* at 0·5 p.p.m. whereas the latter permitted it at 300. It would appear that 8-hydroxyquinoline is the most effective of any fungicide yet tested against the agent of cotton root rot.

Blank (L. M.). **Response of Phymatotrichum omnivorum to certain trace elements.**—*J. agric. Res.*, lxii, 3, pp. 129–159, 3 graphs, 1941.

When certain trace elements were added to the nutrient solution in which *Phymatotrichum omnivorum* [*R.A.M.*, xx, p. 256] was grown, it appeared that iron, manganese, and zinc were essential for optimum growth of the organism, copper had no appreciable effect at the rates of from 0·5 to 10 p.p.m. and almost completely inhibited the growth at 20 p.p.m., while aluminium, boron, cadmium, cobalt, fluorine, iodine, lithium, mercury, molybdenum, nickel, and silicon proved to be non-

essential for optimum growth both in the presence and in the absence of iron, manganese, and zinc. Aluminium and boron, however, were fairly consistent in slightly stimulating the growth of the fungus. Some of the non-essential elements, particularly nickel and cobalt, were highly toxic in concentrations above 4 p.p.m. and some, e.g., nickel, caused depression at 4 p.p.m. Copper, iron, manganese, and zinc induced better growth when added to the purified than to the standard solution. When, however, copper was entirely omitted and iron, manganese, and zinc were used in about the same ratios (2–2–2 p.p.m. being considered the optimum) the results produced in unpurified solutions were equal or superior to those obtained with purified ones. With manganese held constant at 2 p.p.m., increased concentration of zinc in relation to that of iron had an inhibiting effect on the growth of the organism in unpurified solution. Iron exerted an anomalous depressing effect at 10 p.p.m. in the unpurified solution, but this disappeared at higher concentrations. In purified solution copper was somewhat beneficial at 2 p.p.m., without effect at 5 p.p.m., and slightly harmful at 10 p.p.m. The total effect of iron, manganese, and zinc when present together was larger than the sum of their effects when added singly, indicating very important interactions.

Goldsmith (G. W.) & Moore (Elizabeth J.). **Field tests of the resistance of Cotton to Phymatotrichum omnivorum.**—*Phytopathology*, xxxi, 5, pp. 452–463, 1 graph, 1941.

Using rate of growth of *Phymatotrichum omnivorum* on decoction media made from the root system of cotton plants as a criterion in selection for resistance to the fungus the authors were able to increase resistance, the most promising selections being obtained from Native Hopi and Sudan. The average kill in the selected varieties showed a reduction from 1938 to 1939 of 26·3 per cent. The best results were obtained by selecting F_2 hybrids. The percentage kill in selected and non-selected representatives from a selfed variety showed that in 1939, after three selections, the final percentage for Acala was 48·9 for the selected and 94·9 for the non-selected plants, while for Delfos, Stoneville, Dixie Triumph, and Sudan the corresponding figures were 60·5 and 67·6, 46·4 and 55·8, 40 and 44·7, and 34·9 and 58·4 per cent., respectively.

Aoki (K.). **Studies on a fungus parasitic on Muscadine.**—*Bull. seric. Exp. Sta. Chosen*, ix, pp. 453–467, 1 pl., 1 fig., 1939. [Japanese, with English summary. Abs. in *Jap. J. Bot.*, xi, 2, pp. (47)–(48), 1941.]

An Ascomycete, probably a species of *Ceratostoma*, was found parasitizing the yellow muscadine, *Isaria farinosa* [*R.A.M.*, xvi, p. 532], a pathogen of the mulberry pest, *Margaronia pyloalis*, and silkworms in Japan. When *I. farinosa* was inoculated at maturity with the ascospores of its parasite, or the spores of both fungi were jointly cultured in a nutrient medium, the muscadine was overgrown by the Ascomycete which developed its perithecia. The Ascomycete was unable to attack living specimens of *M. pyloalis*, which was soon killed, however, by

I. farinosa in combined inoculation tests with both organisms, thereby enabling the *Ceratostoma* to develop.

Rhodes (P. H.), Conant (N. F.), & Glesne (L. R. B.). **Histoplasmosis. Report of case in an infant 3 months of age.**—*J. Pediat.*, xviii, 2, pp. 235–241, 6 figs., 1941.

Clinical and histological details are given of a case (the fifth in an infant) of histoplasmosis (*Histoplasma capsulatum*) [*R.A.M.*, xix, p. 595; xx, p. 363, and next abstracts] in a three-months-old female child at the Children's Hospital, Cincinnati, Ohio.

Conant (N. F.). **A cultural study of the life-cycle of Histoplasma capsulatum Darling 1906.** *J. Bact.*, xli, 5, pp. 563–578, 3 pl., 1941.

The saprophytic filamentous form of a strain of *Histoplasma capsulatum* isolated from the blood stream of a three-months-old infant at the Duke University Hospital, North Carolina, 24 hours before death [see preceding abstract] produced on Sabouraud's agar at room temperature round or piriform, thick-walled chlamydospores, 7·5 to 15μ in diameter, covered with finger-like protuberances up to 8μ in length, but no asci. On transference to blood agar at 37° C., these organs gave rise in 10 to 14 days to the parasitic yeast-like form of the fungus, characterized by thin-walled, oval cells, 3 by 1·5 to 2μ, reproducing by a single bud from the pointed end.

Howell's interpretation of *H. capsulatum* as a near relative of *Sepedonium chrysospermum* [*R.A.M.*, xx, p. 363] is accepted, with the proviso that the former, lacking a known ascigerous stage, must for the present remain among the Moniliaceae of the Fungi Imperfecti.

Anderson (W. A. D.), Michelson (I. D.), & Dunn (T. M.). **Histoplasmosis in infancy. Report of a case.**—*Amer. J. clin. Path.*, xi, 4, pp. 344–354, 6 figs., 1941.

The writers fully describe a case (the twelfth in the United States and the fifth [see preceding abstracts] in an infant) of histoplasmosis (*Histoplasma capsulatum*). A post-mortem examination of the eight-months-old female child at the University of Tennessee College of Medicine revealed widespread reticulo-endothelial hyperplasmia, the cytoplasm of the phagocytic cells of the spleen, liver, colon, and lungs containing innumerable parasites.

Craig (W. McK.), Dockerty (M. B.), & Harrington (S. W.). **Intravertebral and intrathoracic blastomycoma simulating dumb-bell tumour.**—*Sth. Surgeon*, ix, 10, pp. 759–766, 4 figs., 1940.

The authors present in full detail a case of systematic pulmonary blastomycosis (*Blastomyces* [*Endomyces*] *dermatitidis*) [*R.A.M.*, xix, p. 150; xx, pp. 202, 259] in a 44-year-old farmer admitted to the Mayo Clinic, Rochester, Minnesota, in May, 1939. Cutaneous lesions were absent, the primary clinical manifestations being those of irritation of the nerve roots of the dorsal portion of the spine. The isolation of the causal organism and the consequent final diagnosis of the disease were rendered possible by the technique of rapid frozen section at the time of operation.

Turu (H.). **Über das Verhältnis zwischen der Entwicklung der Hefen und der Wasserstoffionenkonzentration der Nährflüssigkeit.** [On the relation between yeast development and the hydrogen-ion concentration of the nutrient liquid.]—*Hukuoka Acta med.*, xxxiii, 9, pp. 971–992, 2 graphs, 1940. [Japanese, with German summary on pp. 78–79.]

A fully tabulated account is given of the writer's experiments at the Dermatological Clinic of Kyushu University, Japan, on the influence of the hydrogen-ion concentration of the medium on the growth of 22 yeast-like fungi [cf. *R.A.M.*, xvii, p. 528], including *Cryptococcus hominis* [*Debaryomyces neoformans*], *D. fabrii* Ota, *D. grützii* Ota, *Myceloblastanon cutaneum* Ota and its var. Takahashi, and the thrush fungus [*Candida* (?) *albicans*], on 1 per cent. peptone water. The optimum reactions for the development of the organisms were found to range from P_H 5·6 to 7. The acidity of the medium gradually increased, irrespective of the particular organism supported.

Graham (P. V.). **Solitary gummatous sporotrichosis of two years' duration : report of a case.**—*Arch. Derm. Syph., Chicago*, xliii, 5, pp. 805–808, 2 figs., 1941.

Sporotrichum schenckii [*R.A.M.*, xx, p. 203] was isolated on Sabouraud's agar from a solitary gummatous lesion on the left wrist of a 73-year-old man at the Louisville (Kentucky) City Hospital, apparently the first case of this particular type on record. Positive results were given by the intraperitoneal inoculation of a rat with a suspension of the fungus, which was recovered from the epididymal abscesses.

Phillips (E. W.). **Time required for the production of hay fever by spores of a newly encountered fungus, Johnson Grass smut.**—*J. Allergy*, xii, 1, pp. 24–27, 1940.

Johnson grass [*Sorghum halepense*] smut, referred by Stakman to *Sphacelotheca cruenta* or *S. holci* [*R.A.M.*, xvii, p. 453], and by R. B. Streets to *S. sorghi*, was first observed in Arizona in 1931 and by the writer in 1933, since when its distribution and prevalence are stated to have increased annually. The spores of the smut are found (as shown by gravity collections on slides) during at least eight months of the year. Extracts of the fungus elicited no positive reactions in hay-fever patients tested intradermally until the autumn of 1938; in 1939, 34 out of 131 persons, known to be sensitive to inhaled allergens and resident for at least five years in the regions of smut infestation, reacted typically to the injections. Fifteen of the positive reactors experiencing recurrences of hay fever or asthma were promptly relieved by the addition of the smut extract to their regular pollen therapy. Up to the present, the fungus has acted only as a subsidiary cause of inhalant allergy, and a minimum of five seasons' exposure to its spores was required to induce cutaneous and clinical sensitivity.

Díaz (C. J.), Lahoz (C.), & Recatero (L.). **La sensibilización a la caries del Trigo (niebla o tizón) como causa de asmas estacionales.** [Sensitization to Wheat caries (mildew or bunt) as a cause of seasonal asthmas.]—*Rev. clín. esp., Madr.*, ii, 2, pp. 135–138, 3 figs., 1941. [German and French summaries.]

Two cases are reported, one in an 18-year-old girl and the other in

a 29-year-old male from different parts of Spain, of seasonal asthma associated with allergy to the spores of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*], not only epidermal reactions but passive transmission being positively demonstrated in both patients. The importance of these organisms in the etiology of millers' asthma has already been shown [*R.A.M.*, xx, p. 303], and considerable interest is therefore attached to their intervention in these instances of another form of the malady. G. Villasante, working in the authors' laboratory at the Institute of Medical Investigations, Madrid, has frequently isolated bunt spores from the faeces of persons suffering from digestive allergies (unpublished observations), indicating the possible implication of *T.* spp. in disturbances of this type.

Pennington (Edna S.). **A study of clinical sensitivity to air-borne molds.**—*J. Allergy*, xii, 4, pp. 388–402, 1941.

Continuing her studies at Nashville, Tennessee, on clinical sensitivity to air-borne moulds (including *Alternaria*, *Hormodendrum*, *Aspergillus*, *Mucor*, and *Rhizopus* spp., *Monilia sitophila*, *Penicillium rubrum*, and *Cephalothecium* [*Trichothecium*] *roseum*) in asthmatic and hay-fever patients selected from the original group of 526 [*R.A.M.*, xx, p. 16], the writer demonstrated, by passive transfer, reagins to one or more of such organisms in 13 out of 18 persons. Systemic reactions to mould injections developed in 33 (7·3 per cent.) of the 526 patients. 'Provocative' tests, involving the direct application of mould spores or concentrated extracts (1 : 20) to the mucous membranes of the nose and throat, were carried out on 61 skin-sensitive patients, of whom 22 (36 per cent.) reacted positively. It is concluded that mould sensitivity is not uncommon and deserves consideration in any exhaustive study of the allergic state: children are comparatively frequent sufferers, comprising in the series under observation 9·7 per cent. of the total number of patients. [This paper was followed by a discussion reported on pp. 403–404.]

Chobot (R.), Dundy (H.), & Schaffer (N.). **Relationship of mold reactions to clinical symptoms.**—*J. Allergy*, xii, 1, pp. 46–54, 1940.

Out of 244 asthmatic and hay-fever patients (123 children and 117 adults) tested intracutaneously at the New York Post-Graduate Medical School for their reaction to certain moulds, with special reference to *Alternaria* [*R.A.M.*, xx, p. 204], 66 (27·5 per cent.) gave positive results. Twelve of a series of 28 selected cases with positive reactions were found to be constitutionally sensitive. Cross-neutralization tests showed sensitivity to the mould to be specific. The percentages of persons in the above-mentioned series giving moderate to marked reactions in intracutaneous tests with *Penicillium*, *Hormodendrum*, *Mucor*, and *Aspergillus* were 4·2, 1·7, 2·1, and 1·2, respectively.

Parsons (C. H.). **A visual mold test for cream, and patron reaction to it.**—*Nat. Butt. Cheese J.*, xxxii, 3, pp. 12–13, 56–69, 1941.

The writer's visual test for the detection of moulds [including *Oospora lactis*] in cream is a modification of the Wildman technique [*R.A.M.*, xx, p. 260] involving the use of a reagent consisting of 120 gm.

dry borax, 225 gm. crystalline disodium phosphate, 30 gm. sodium hexametaphosphate, 0·4 gm. medicinal methylene blue powder, and 3½ qts. soft water, 17·6 c.c. of which is added to 9 c.c. of the sample to be examined. The 2 oz. sample jar containing the cream and reagent mixture is then transferred to a water bath with a temperature of not less than 180° F., the mixture stirred for three minutes, and left for another half-minute, when the jar is removed and rotated four or five revolutions to bring the mould to the centre. The contents of the jar are next filtered through an organdie disk and the disk compared with a set of comparison standards prepared by the Research Committee of the American Butter Institute, the results being reported as good, fair, poor, and very poor. Some 8,000 samples were tested by this method over an eight-week period in the southern United States in 1940, and most of the farmers visited for the purpose showed great willingness to co-operate in its use for the elimination of mould.

Baylis (G. T. S.). **Flax wilt (Fusarium lini) in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxii, 3, pp. 157–162, 2 figs., 1940.

Instances are on record in which the agent of flax wilt (*Fusarium lini*) has persisted in the soil of plots of the Liral Crown variety for periods of four to eleven years in the Marlborough and Canterbury districts of New Zealand, where the disease has only recently been recognized. Oil varieties are in general more susceptible than those grown for fibre, but the small-seeded North Dakota 52 and 11 and the large-seeded Rio showed marked resistance in experiments involving the cultivation of 19 varieties on infected soil, with 0·7, 0·6, and 0·3 per cent. infection, respectively. The incidence of wilt among the five fibre varieties ranged from 1 to 5·6 per cent. (Stormont Cirrus and Concurrent, respectively), while the most susceptible of all varieties included in the trials were Punjab (small-seeded oil) and Moose 11/29 (large-seeded oil), with 22·8 and 19·3 per cent., respectively. Three isolates of the fungus were grown on potato extract agar and spore suspensions of the cultures inoculated into Liral Crown (fibre) and a commercial oil flax, on which they produced 4 to 22 and 13 to 27 per cent. infection, respectively, isolate No. 3 being uniformly the most pathogenic of the three. Isolates 2 and 3 were examined by W. L. Gordon, Dominion Laboratory of Plant Pathology, Winnipeg, Canada, who referred both to *F. lini*, though No. 2 is classed as a variant presenting certain anomalies (longer spores and absence of colour on potato dextrose agar and rice) suggestive of *F. conglutinans* var. *callistephi*. For the time being, attempts at control are being directed towards the selection of healthy sites and the use of disease-free seed.

Stoutemyer (V.), Hope (C.), & Close (A.). **Sphagnum for seed germination inhibits damping-off losses on unsterilized soil.**—*Nat. hort. Mag.*, xx, 2, pp. 111–120, 3 figs., 3 graphs, 1941.

Particulars are given of experiments at the United States Plant Introduction Garden, Glenn Dale, Maryland, the outcome of which showed that damping-off of ornamentals, including *Buddleia japonica*, *Mimulus lewisii* and *M. ringens*, *Sorbaria* [*Spiraea*] *sorbifolia*, *Oxydendron arboreum*, *Rhexia mariana*, and *Rhododendron*, is preventable by

the use as a medium for seed germination, instead of sand, soil, or sand-peat mixtures, of living or dried sphagnum moss, preferably with the addition of Dunlap's two-salt nutrient solution (*Circ. Conn. agric. Exp. Sta.* 129, 1939) consisting of one teaspoonful each of superphosphate and potassium nitrate per gal. water in an amount sufficient for saturation of the substratum.

Lyckås (C.). **Provdrivning av blomsterlökar vintern 1940–41.** [Experimental forcing of flower bulbs in the winter of 1940–41.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1941*, 2, pp. 27-30, 1 fig., 1941.

Among the damaged lots of imported flower bulbs used in forcing experiments on commercial lines at the Swedish Plant Protection Institute in the winter of 1940–1 were some of narcissus infected by *Fusarium bulbigenum* [*R.A.M.*, xix, p. 539], the rotted areas being of a greyish to chocolate-brown colour and malodorous. Dead bulbs frequently bear a greyish-white or pink mycelial efflorescence. At the beginning of October 58 bulbs of Van Waveren's Giant and Pride of Hillegom were planted, taken from severely infected lots, 39 being apparently sound, 9 slightly discoloured at the base, and 10 obviously diseased. At the time of flowering in February, 49 bulbs were found to have developed normally, while nine were completely decayed. The probable incidence of infection by *F. bulbigenum* in a given stand can therefore be predicted with a fair degree of accuracy by careful selection before planting.

Thirumalachar (M. J.). **Tuberculina on Uromyces hobsoni Viz.**—*J. Indian bot. Soc.*, xx, 3, pp. 107–110, 1 pl., 1941.

The author records the occurrence of a species of *Tuberculina*, tentatively referred to *T. costaricana* Syd., attacking the aecidia and pycnidia of *Uromyces hobsoni*, a parasite causing hypertrophy of the flower buds of *Jasminum grandiflorum* in India [*R.A.M.*, xix, p. 22]. The fungus forms a purple-black coating of spherical, thin-walled conidia, 8·6 by 6·8μ, over the infected buds. The development of teleutosori in the infected aecidia was entirely suppressed, thereby effectually preventing the perpetuation of the rust from one season to the next by means of its resting stage.

Dodge (B. O.) & Laskaris (T.). **Papulaspora gladioli.**—*Bull. Torrey bot. Cl.*, lxviii, 5, pp. 289–294, 2 figs., 1941.

The fungus causing the so-called smut disease of gladiolus commonly known as *Urocystis gladioli* [*R.A.M.*, xviii, p. 33] is shown to be a species of the genus *Papulaspora* and not *Urocystis* as has been hitherto assumed. That it is not a smut fungus is demonstrated by the multinucleate condition of the hyphal cells and the central and boundary cells of the bulbils; by the capacity of producing mature spore balls in culture within a week; and by the method of germination in the absence of a fusion nucleus or a promycelium. The bulbils develop on side branches of the mycelium growing more or less superficially on diseased corms. Powdery masses of the dark brown bulbils may resemble sori of *Urocystis* chlamydospores. A new combination, *P. gladioli*, is

proposed, with an amended description: the mycelium is white at first, profuse, consisting of multinucleate cells; the bulbils are borne on septate stalks and are light to dark brown in the mass, spherical, 29 to 64μ in diameter with from one to six (or more) central, dark brown, multinucleate cells surrounded by a single layer of light brown cortical cells, each with several nuclei. The bulbil primordium is a lateral branch ending in a coil. Individual cells of the bulbils germinate with simple or branched germ-tubes. In culture bulbils mature in four to ten days; conidia were not seen. Exposure to 44° C. for 30 minutes failed to kill the bulbils, so that similar treatment of the corm would not control the disease.

Kevorkian (A. G.) & Horn (C. L.). **The use of fungicides on Orchids.** —*Amer. Orchid Soc. Bull.*, ix, 12, pp. 328–330, 1 fig., 1941.

At the Puerto Rico Experiment Station no injury was done to orchids (*Cattleya*, *Epidendrum*, and *Oncidium* spp.) when sprayed with Bordeaux mixture 2–2–50, 4–4–50, and 8–8–50, or when cuprocide 54, cuprocide 54–Y, semesan, and ceresan were used in concentrations recommended by the manufacturers. Plants carefully inspected, severely pruned, and well sprayed remained healthy, while others, untreated, became seriously damaged by *Fusarium*, *Macrophoma*, and *Diplodia* spp. So far, 45 known and several undetermined genera of orchids have been periodically sprayed with Bordeaux mixture without injury to any plant.

Parsche (F.). **Lime chlorosis of Lupines.**—*Bodenk.u.PflErnähr.*, N.F., xix, pp. 55–80, 1940. [German. Abs. in *Chem. Abstr.*, xxxv, 10, pp. 3292–3293, 1941.]

In further experiments [? at Tetschen-Liebwerd, Czechoslovakia] lupins grown in 5½ kg. pots of sand with the addition of calcium chloride at the rate of 0·53 gm. calcium per pot developed chlorosis [*R.A.M.*, xv, p. 298], the affected plants being higher in water-soluble, sodium chloride-exchangeable, and hydrochloric acid-soluble calcium than normal ones grown in unlimed pots, although the hydrogen-ion concentration of the soil was not modified by the treatment. Chlorotic plants were generally lower in dry substance and contained less filterable iron in the sap than normal ones, although the total iron contents were similar or the differences were inconsistent. Infiltration experiments on chlorotic leaves showed that only iron salts were uniformly remedial, though 0·01 per cent. sulphuric acid sometimes induced a renewal of the green coloration in the foliage before death. The cause of chlorosis is thus evidently not deficiency of total iron, but its inactivation or precipitation within the leaf. The condition also resulted from the infiltration of green leaves with very dilute ammonium hydroxide or ammonium sulphate.

The hypothesis that lime chlorosis in lupin seedlings is due to the limitation of protein synthesis through the retardation of carbohydrate consumption by calcium, leading to an accumulation of ammonia, which increases the P_H of the cell sap and inactivates the iron therein, was supported, but not absolutely proved, by the results of ammonia and amide nitrogen determinations in healthy, lime-, and ammonia-chlorotic foliage, and of P_H soluble iron and other analyses.

Hadorn (C.). **Der Schorf und seine Bekämpfung. Bericht über die Versuche im Jahre 1940, gemeinsam durchgeführt mit den Kant. Zentralstellen Oeschberg, Zürich, Arenenberg.** [Scab and its control. Report on experiments in the year 1940, conducted in co-operation with the cantonal centres at Oeschberg, Zürich, and Arenenberg.]—*Schweiz. Z. Obst- u. Weinb.*, l, 10, pp. 214–230, 2 figs., 1941.

A tabulated account is given of eight experiments in apple scab [*Venturia inaequalis*] control carried out during 1940 in climatically different parts of Switzerland [*R.A.M.*, xix, pp. 26, 263], the following being among the conclusions drawn from the tests. There was little difference between the 'simple' and 'concentrated' lime-sulphurs (22° and 32° Baumé) as regards leaf scorch; in respect of fungicidal efficacy the former proved slightly superior. Winter and summer coppers, especially the former consisting of 0·15 per cent. copper oxychloride (32 per cent.), gave somewhat better results than 0·1 per cent. iron sulphate as adjuvants to 2 per cent. lime-sulphur. Copper oxychloride dusts may safely be used for late summer treatments (August and onwards) without risk of scorching the foliage, paste preparations of the same compound being less reliable in this respect. A particularly heavy deposit is left on the foliage by the lime-sulphur-iron sulphate mixtures, thereby providing a good foundation for the lime-sulphur-lead arsenate treatments. The deposit left by the lime-sulphur-copper mixture also adheres well, while the fine bluish-grey deposit of copper oxychloride dust is regarded as specially effective against storage scab [ibid., xix, p. 710].

Discussing the application of these and other pertinent observations to the future organization of the Swiss spraying schedule, with special reference to 1941, the writer insists on the importance of the blossom treatments (2 per cent. lime-sulphur plus 0·1 per cent. iron sulphate or 0·15 per cent. copper oxychloride at the calyx stage) in April and May, when the risk of primary infections is at its height. In view of the need for economy in copper, petrol, and labour, one pre-blossom application of 3 per cent. lime-sulphur plus 0·2 per cent. copper oxychloride must suffice.

Zäch (C.). **Ergebnisse von chemischen Untersuchungen im Zusammenhang mit den Schorfbekämpfungsversuchen 1940.** [Results of chemical studies in connexion with the scab control experiments 1940.]—*Schweiz. Z. Obst- u. Weinb.*, l, 10, pp. 231–236, 1 graph, 1941.

In part I of this paper the writer summarizes the results of his analyses of the lime-sulphur mixtures used in the Swiss apple scab [*Venturia inaequalis*] experiments of 1940 [see preceding abstract]. All the eight samples tested fulfilled the minimum official requirement of 10 per cent. polysulphide sulphur for the 'simple' lime-sulphurs, their actual contents ranging from 11·5 to 14 per cent., the corresponding figures for the 'concentrated' mixtures (for which no minimum demands have yet been fixed) being 16·5 to 22·5 per cent. The specific gravities of the 'simple' and 'concentrated' lime-sulphurs were found to range from 21° to 24° Baumé and 26° to 32°, respectively. The

'concentrated' brands are used at a strength of only 1 per cent., in comparison with 2 per cent. for the 'simple' mixtures.

Part II deals with the arsenic content of lead arsenate-sprayed apple leaves and fruits.

EKSTRAND (H.). **Försök med borax som medel mot pricksjuka hos Äpple.** [Experiments with borax as a remedy against bitter pit of Apples.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1941*, 1, pp. 6–11, 1 graph, 1941.

An account is given of experiments conducted at the Swedish Plant Protection Institute, Stockholm, and at the Svartsjö Royal Farm, in 1939 and 1940, to determine the value of borax treatments in the control of bitter pit of apples (which the author regards as synonymous with internal cork) [*R.A.M.*, xix, pp. 603, 604]. To cite some figures from the accompanying tables, the incidence of the disease developing in storage among apples from a Ribston Pippin tree receiving 250 gm. borax (strewn over an area surrounding the base corresponding to the circumference covered by the crown) was 10·6 per cent. compared with 50 per cent. for an untreated control. In another test on the Peasgood Nonesuch variety the percentage of bitter pit in the fruit from borax-treated trees at harvesting ranged from 0·5 to 7·2 per cent compared with 3·5 to 26·1 per cent. in the controls, the average amount of disease developing in storage in the two lots being 12·3 and 3 per cent. respectively.

GERHARDT (F.) & EZELL (B. D.). **Physiological investigations on fall and winter Pears in the Pacific Northwest.**—*Tech. Bull. U.S. Dep. Agric.* 759, 66 pp., 7 figs., 21 graphs, 1941.

This fully tabulated survey of the data obtained in the writers' studies from 1931 to 1935 on the physiological and biochemical changes undergone by the five chief pear varieties of the Pacific Northwest, viz., Comice, Aragon, Bosc, Flemish Beauty, and Winter Nelis, during the processes of handling, harvesting, storage, and ripening, includes observations on scald and Anjou scald [*R.A.M.*, xiii, p. 246] and core breakdown [ibid., xii, p. 102] and their control. It was noted that scalded fruits showed less oxidase and catalase activity than healthy ones, while in Comice an increase of acetaldehyde content was closely associated with both scald and breakdown, especially in fruit held at 36° as against 32° F., delayed storage after harvest being conducive to the production of abnormally large quantities of this volatile constituent. In the Comice variety loss of ripening capacity was found to be a concomitant of scald and breakdown. Pear scald, unlike the similar disorder of apples, cannot be controlled by the use of oiled paper wraps (which are, however, valuable in the case of Anjou scald); harvesting at the correct stage of maturity and immediate storage at 30° to 32° in the presence of carbon dioxide for a not unduly protracted period are important measures against both scald and breakdown.

LEACH (R.). **Banana leaf spot Mycosphaerella musicola, the perfect stage of Cercospora musae Zimm.**—*Trop. Agriculture, Trin.*, xviii, 5, pp. 91–95, 2 pl., 3 figs., 1941.

During an examination of banana leaves infected with *Cercospora musae* in Jamaica the author observed two-celled spores, apparently

ascospores, which had developed germ-tubes and appressoria similar to those of *C. musae*. Perithecia producing such spores were found without much difficulty and single ascospore isolations gave rise to cultures identical with those of *C. musae*, and yielding conidia of *C. musae* by the method of Meredith and Butler [*R.A.M.*, xix, p. 228]. Inoculations of heart leaves of Gros Michel plants with suspensions of conidia so obtained repeatedly gave rise to typical leaf spot lesions on which the conidia of *C. musae* were abundantly produced. The perfect stage, which is named *Mycosphaerella musicola* n.sp. [without a Latin diagnosis], is characterized by dark brown or black, amphigenous, erumpent perithecia, scattered on mature leaf spots, having a short protruding ostiole, a well-defined dark wall, and measuring 46·8 to 72 (mean 61·8)μ in diameter. The oblong-clavate asci measure 28·8 to 36 by 8 to 10·8μ. The bicellular, hyaline, obtuse-ellipsoid ascospores measure 14·4 to 18 (mean 16·7) by 3 to 4μ, are slightly wider in the upper than in the lower cell, and do not show a marked constriction at the septum except when dead. No paraphyses were noted.

At 70° to 84° F. the most rapid ascospore germination occurred in 2½ hours on plain agar. The germ-tubes nearly always grew out from both ends, though not simultaneously; they never developed from the sides. The robust hyphae, 2μ wide, grew out in line with the long axis, no side branching occurring during the first 24 hours, when the growth rate was not above 5μ per hour. Evidence of ascospore infection of banana leaves was obtained experimentally.

Ascospore discharge is not dependent on the presence of surface moisture on the leaf spots, and can take place from the lower leaves when their shaded position prevents the formation of dew, and thereby suppresses conidial production. The ascospores are also essentially wind-borne, while the conidia are readily removed from the sporodochia by water but not by wind. If there is a large population of heavily spotted leaves, ascospores may reach the heart leaves in as great abundance as do the conidia. Natural infection of a newly opened heart leaf may be as severe as that by conidia.

Ascospores may well reach the heart leaves without coming into contact with spray material, so that spraying cannot be relied upon to control this form of infection. Ascospore production and discharge appear, however, to be purely seasonal, and it would therefore seem that control would be assisted by the collection and disposal of all dead, spotted leaves before the season of ascospore discharge.

The disease was probably spread comparatively rapidly through Jamaica by means of the ascospores, as bananas are generally taken to the coast packed with infected trash leaves from which ascospores might be more easily disseminated than conidia.

[A popular account of the discovery of the ascigerous stage of *C. musae* is also given by the author in *J. Jamaica agric. Soc.*, xlv, 3, pp. 80–81, 1941.]

Uppal (B. N.), Patel (M. K.), & Kamat (M. N.). **Powdery mildew of the Mango.**—*J. Univ. Bombay*, N.S., Biol. Sci. Sect., ix, 5, pp. 12–16, 1 fig., 1941.

The causal organism of mango powdery mildew in Bombay has been

referred by Wagle to *Erysiphe cichoracearum* [*R.A.M.*, vii, p. 654], but since no description was given of the perfect stage, the authenticity of its connexion with the disease is considered dubious and the name originally applied by Berthet to the fungus in Brazil (*Oidium mangiferae*) preferred (*Bol. Agric., S. Paulo*, xv, pp. 818–819, 1914), an amplified diagnosis being given. The branched, hyaline, superficial mycelium, composed of septate hyphae, 4·1 to 8·2μ in diameter, forms a dense, white coating on the inflorescence and its stalk, and on the young fruits. Saccate or lobate haustoria (not characteristic of *E. cichoracearum*) are produced. Unicellular, hyaline, elliptical conidia, 25 to 48·9 by 16 to 23·9 (average 42·9 by 18 to 21·9)μ, are borne singly, or rarely in chains of two, on erect, simple conidiophores, 64 to 163μ in length, with two or more basal cells. The optimum temperature for germination (effected by means of a germ-tube) is 22° C., with a minimum at 9° and a maximum at 30°. During the cold season, when favourable temperatures for this process prevail along the coast, the mildew may assume a destructive form.

Lin (C. K.). **Germination of the conidia of Sclerotinia fructicola, with special reference to the toxicity of copper.**—*Mem. Cornell agric. Exp. Sta.* 233, 33 pp., 2 figs., 23 graphs, 1940.

In this study on the chemical factors promoting and inhibiting the germination of the conidia of *Sclerotinia fructicola* the author found that germination does not usually take place in pure water, though occasionally a small percentage of the conidia germinate with the production of minute germ-tubes. Vigorous germination is, however, induced by the addition of a small amount of a carbohydrate or of ethyl alcohol. When the density of the spores is about 35,000 per c.c., an increase in the concentration of the dextrose or of the ethyl alcohol up to 0·1 mg. per c.c. increases the percentage germination. At a concentration of 0·01 mg. per c.c. more spores germinate in alcohol solution than in dextrose solution. In the presence of a sugar, the spores also germinate under anaerobic conditions, while in the absence of oxygen ethyl alcohol does not induce germination. In these cases energy supply appears to be the limiting factor in germination.

In a pure dextrose or alcohol solution germination is very variable, the percentage seldom exceeding 90; when a little magnesium sulphate is added, germination invariably reaches 95 to 100 per cent. At a concentration of 0·1 millimol per l. magnesium chloride, magnesium nitrate, calcium sulphate, calcium chloride, and basic potassium phosphate also increased percentage germination. Both 0·01 and 100 millimolal calcium chloride or magnesium nitrate promote spore germination and germ-tube elongation, but exercise an inhibiting effect at 1 millimol per l. concentration. With aluminium chloride inhibition is greatest at 0·01 millimol per l., being lower above and below this concentration. It is apparent that the effect of these salts is not due to their function as nutrients, and it is suggested that there may be a relation between the colloidal effect of the electrolytes and spore activity.

In a pure dextrose solution the lethal dosage of copper is about 10 to 100 times lower than has previously been reported. The smallest

number of copper atoms required to inhibit the germination of one spore is estimated at about ten billion.

Electrolytes act as antidotes to copper toxicity and promote germination, the data indicating that their effectiveness in this respect depends upon the concentration and valency of the ions and upon the P_H.

If it is assumed that copper precipitates certain cell colloids, the antidoting effect of electrolytes would appear to result from peptization of the precipitated colloids. This view is supported by the fact that electrolytes induce the germination of spores already poisoned by copper. The primary toxic action of copper does not seem to kill the spores, but prolonged copper treatment causes gradual loss of germinability of the spores in an electrolyte-dextrose solution, probably owing to an irreversible harmful process distinct from the primary toxic action of the copper. Apparently, the poison and the antidote cause spore inactivation and reactivation, respectively, as the normal cell functioning depends on the colloidal condition of the cell protoplast.

Dunlap (A. A.). **Plant diseases in Texas and their control.**—*Circ. Tex. agric. Exp. Sta.* 91, 70 pp., 30 figs., 1941.

This booklet presents in a clear and readily intelligible form the accumulated results of many years' research on the control of the principal diseases of economic crops in Texas.

Neergaard (P.). **Seed-borne fungous diseases of horticultural plants.**—*C.R. Ass. int. Essais Semences, 1940*, 1, pp. 47–71, 1940.

This is a useful survey of the principal diseases of horticultural plants, embodying information on their distribution, incidence of seed infection, and economic importance in relation to the crop. A table shows the methods of seed-testing employed for the demonstration of different groups of fungi, and a six-page bibliography is appended.

New and promising varieties recently described in the literature.—6 pp., Cambridge, Imp. Bur. Pl. Breed., 1941. 1*s.* 0*d.*

A list is presented in tabular form of potentially valuable, recently developed varieties of important agricultural crops, incorporating the Latin and varietal names, qualities (including reaction to major diseases), addresses from which further information may be obtained, and origin.

Lubishtsheff (A. A.). Об определении вредоносности методом искусственных повреждений. [On the determination of injuriousness by the method of artificial injury.]—*J. Bot. Acad. Sci. Ukr.*, i, 1, pp. 159–188, 1940. [English summary.]

This is a critical review of work on the effect of experimental mechanical injury (such as the removal of leaves or parts of leaves) on plant growth undertaken with the object of correlating such injury with that caused by diseases and pests. The author concludes that the potential value of this technique has been greatly overestimated and that the method is at best only auxiliary to direct field investigations.

Snow (A. G.). **White Pine propagation.**—*J. For.*, xxxix, 3, pp. 332–333, 1941.

In nearly all cases in which white pine [*Pinus strobus*] cuttings have

taken root at the North-Eastern Forest Experiment Station, the rooting medium (a sand-peat mixture 3 : 2, previously used for the same purpose and containing many partially decomposed needles) was infected by several species of fungi. In the absence of direct experimental proof it is surmised that these organisms may exert a beneficial effect on propagation, either by acting as a supplementary source of natural auxins, which have been found to assist in the rooting process, or in a symbiotic capacity.

Chaudhuri (H.) & Quraishi (A. R.). **A study of the fungal endophyte of some Anthoceros erectus Kashyap.**—*Proc. Indian Acad. Sci.*, xiii, 4, pp. 255–260, 1 pl., 1941.

The thalli of specimens of the liverwort, *Anthoceros erectus* [cf. *R.A.M.*, xv, p. 179], from Mussoorie were found to contain an endophyte in all parts but more generally in the basal region, characterized by hyphae of two kinds (*a*) thin-walled, not distinctly septate, 3·5 to 5·4μ in diameter, and (*b*) septate, 6μ in diameter, occasionally forming knots and often swollen at the tips. Infected plants are dwarfed and fail to produce sporogonia of normal size. On potato glucose agar the endophyte forms light brown, branched, septate hyphae, 2·8 to 8·5μ in diameter, intercalary or lateral chlamydospores of very variable dimensions (average 7 to 9μ in diameter), and thick, dark-coloured sclerotia, 310 by 260μ.

Marsh (R. W.) & Martin (H.). **Simplified methods of Potato blight control : Progress report I—spraying methods.**—*Rep. agric. hort. Res. Sta. Bristol, 1940*, pp. 63–75, [1941].

In order to find a simple method of spraying potatoes against *Phytophthora infestans* suitable for use in private gardens and allotments, tests were made at a number of centres in the Bristol advisory province during 1940 with a watering can fitted with a fine rose and a variety of compounded copper fungicides employed in comparison with Bordeaux and Burgundy mixtures.

The results obtained showed that sprinkling from the can was much quicker and easier than spraying with a 'Solo' bucket pump, except with Bordeaux mixture, which choked the holes of the rose. The amount of spray needed in sprinkling was not more than that required when spraying. Though the weather was unfavourable to infection, the evidence indicated that sprinkling will effect control even when no attempt is made to cover the under side of the leaves. The deposit left by sprinkling was as much as that left by spraying, except when the applications were made before full haulm development. There was no indication that the deposit left by sprinkling was lacking in tenacity. The deposit from the compounded products was slightly less in quantity than that left by Bordeaux mixture when equal amounts of spray of the same copper content were applied, possibly owing to the less perfect dispersion of the compounded products.

Hickman (C. J.). **Simplified methods of Potato blight control : Progress report II—dusting methods.**—*Rep. agric. hort. Res. Sta. Bristol, 1940*, pp. 76–79, [1941].

In further tests to find a simple method of controlling potato blight

[*Phytophthora infestans*] in private gardens and allotments [see preceding abstract], comparative trials were made with a home-made dust distributor, consisting of a cylindrical tin measuring 6 by 4 in. with holes $\frac{1}{25}$ in. in diameter drilled about $\frac{1}{4}$ in. apart in one end, which was covered with a piece of fine muslin held in position by means of a rubber band, and a hand-operated rotary blower made by the Niagara company. The dusts used were copper sulphate monohydrate and cuprous oxide (cuprocide GA), both made up to contain 15 per cent. by weight of copper. No information on blight control was obtained as the disease did not appear, but the results showed that initial retention of dust was greater in the plots dusted with the home-made apparatus. Three disadvantages, however, were attached to the hand-made duster: it took longer than the blower to apply a given amount of dust, a relatively small proportion of the dust reached the under surface of the leaves, and a larger proportion of leaves remained virtually untreated.

Klaus (H.). **Untersuchungen über Alternaria solani Jones et Grout, insbesondere über seine Pathogenität an Kartoffelknollen in Abhängigkeit von den Außenfaktoren.** [Investigations on *Alternaria solani* Jones & Grout, with special reference to its pathogenicity in Potato tubers as dependent upon external factors.]—*Phytopath. Z.*, xiii, 2, pp. 126–195, 9 figs., 5 graphs, 1 map, 1940.

In cultural studies conducted over a number of years at Dahlem, Berlin, isolates of *Alternaria solani* [*R.A.M.*, xviii, p. 474] from various sources were found to vary in their capacity to form spores and to produce pigment, in their sensitivity (the tendency to interruption of the normal growth of the mycelium), and in the size of the spores. Infection was obtained artificially in both sound and wounded potato tubers. The former were most susceptible to infection just after harvest, indicating that infection of unwounded tubers in storage need hardly be expected. In varietal trials, Frühmölle was more susceptible than Erstling [Duke of York] and Spaulding Rose; in the last-named variety, however, the lesions expanded in some cases more rapidly than in the other two.

Temperature and humidity proved to be limiting factors for mass spore production, the optimum conditions prevailing at 26° C. and 100 per cent. relative air humidity. The exact optimal temperature was established *in vitro* as 26·1°, with a minimum at 1·5° and a maximum at 34·5°. Light and carbon dioxide content of the air were of less importance: very weak light intensities of about 200 Lux were sufficient for spore formation, which was inhibited only by complete darkness and concentrations of carbon dioxide of over 0·5 per cent. Although an air humidity of 100 per cent. proved optimal for the growth of the mycelium, a range of from 34 to 100 per cent. did not influence the spread of the fungus in the tubers. The water content of the tuber seemed also without effect. It was found that an osmotic pressure of 130 atmospheres is necessary to arrest the growth of the fungus, and since the osmotic capacity of the potato sap reaches its maximum at 11 atmospheres, it can have no effect upon the spread of the fungus in the tuber. Carbon dioxide concentrations above 0·5 per cent. were harmful to mycelial growth *in vitro*, but 12 per cent. failed to exercise

a marked effect on the spread of the fungus in the tuber. Lowering the oxygen content to 2 per cent. had no inhibiting effect upon the mycelial growth in pure culture, the only visible effect being a lighter colouring of the hyphae. The development of the fungus in the tuber was arrested by lowering the oxygen content to below 10 per cent., so that changes of the oxygen content likely to occur in storage are without effect. A correlation depending above all upon temperature was found to exist between wound cork formation and the spread of the fungus in the tuber, the optimal temperature for the development of the disease being 14·5° to 17°. The humidity and the oxygen content of the air have also an effect on the wound cork formation, but not on the spread of the disease.

Most of the strains of *A. solani* encountered in Germany are of a comparatively weak pathogenicity and the losses caused by the disease are, therefore, likely to be less serious at first than in America. As a measure of control early potatoes should be left to mature well in the ground, and contact between tubers and foliage avoided.

McIntosh (T. P.). **The spread of black leg in Potato stocks.**—*Gdnrs' Chron.*, Ser. 3, cix, 2837, p. 184, 1941.

In this paper the author adduces evidence in support of the view that outbreaks of potato blackleg [*Erwinia phytophthora*] may be due to infection from contaminated soil. In the first place, it has never been suggested that the disease is transmissible through true seeds, and during twenty years' experience the author has never seen the disease in the first years of the lives of certain varieties, such as Arran Consul, the stocks of which now contain a high percentage of infection. The organism must therefore have gained entrance to the stock other than by planting diseased setts. On one occasion, the writer, in growing 2,000 first-year seedlings, counted about 3 per cent. infection. Further, in building up virus-free stocks of certain varieties, he found that the progeny of apparently healthy plants may produce crops during the following year with 10 per cent. or more infection. In many instances, incidence has been higher in tubers from apparently healthy plants than in those from affected ones. On the other hand, tubers from diseased plants, if planted in good soil, seldom reproduce the disease the next year. In one small experiment, tubers were cut into two, one piece of each being planted in a dry, and the other in a wet, locality. Infection was later negligible in the former place, but reached 13 per cent. in the latter. On another occasion, the author observed across a valley a clear line of discoloured potato foliage; it was observed that the upper part of this line began below a spring, the discoloured foliage throughout the line being entirely due to blackleg; in the rest of the field the disease was negligible. In investigating complaints from farmers about blackleg attributed to bad seed the author frequently noted that one stock was infected while another from the same seed source was not. Very few outbreaks were, in fact, traced to infected seed.

Injury to the haulm, such as that which occurs when plants are trampled on, doubtless provides the organism with a means of ingress to the plant. Cutting the seed setts also increases the disease. Incidence,

however, is always highest in wet soil, and cut seed should never be planted in such soil. The first means of control is drainage.

RAMSEY (G. B.). **Botrytis and Sclerotinia as Potato tuber pathogens.** — *Phytopathology*, xxxi, 5, pp. 439–448, 2 figs., 1941.

Botrytis cinerea was isolated from rotted Bliss Triumph potato tubers [*R.A.M.*, xiii, p. 322] received at the Chicago market from California in January, 1938, following several months' storage, some 5 per cent. being affected by the brown, watery decay characterizing the advanced stage of infection, and 9 per cent. by the incipient dry phase, consisting of sunken, pitted, discoloured areas penetrating $\frac{1}{8}$ to $\frac{1}{4}$ in. into the flesh; two days later the same lot showed 35 per cent. rot, the typical greyish-brown spores of the causal organism being present on the tuber surface in the later stages of disintegration.

In inoculation experiments with the mycelium of *B. cinerea* on wounded Bliss Triumph and Irish Cobbler tubers, a strongly pathogenic effect was exerted on those held at 40° F. in an atmosphere of extreme humidity, whereas at 70° decay seldom resulted, indicating that at the latter temperature suberization and wound periderm formation usually occur with sufficient promptitude to bar invasion by the fungus. A longer period than three days at 70° was, however, necessary for the formation of enough periderm to withstand subsequent exposure to a colder atmosphere. Freshly injured tubers sprayed with a suspension of *B. cinerea* spores in sterile water developed the characteristic water decay at 40° but not at 70°, despite the profuse mycelial growth over the diseased areas at the latter temperature.

Inoculation tests on Bliss Triumph tubers with *Sclerotinia sclerotiorum*, *S. intermedia*, and *S. minor*, resulted in appreciable infection by the last-named at 70°, while *S. intermedia* was the principal agent of decay at 40° and 32°.

Wounded control tubers held at 40° under very humid conditions underwent slight suberization but formed no wound periderm within a month, whereas those maintained at 70° revealed extensive suberization and wound periderm formation within three days, suggesting that the risk of decay through wound infections from the sources under observation may be greatly reduced by keeping potatoes under conditions of moderate temperature and humidity for three or more days after harvesting.

BELOVA (Mme O. D.). Кольцевая гниль Картофеля и меры борьбы с ней. [Ring rot of Potato and its control.]—*C.R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow, 1940*, 19, pp. 21–26, 3 figs., 1940.

Ring rot of potatoes caused by *Bacterium sepedonicum* [*R.A.M.*, xx, p. 273] is stated to be widespread in the central and northern parts of the U.S.S.R. [ibid., xv, p. 251]. In the dry, southern districts the disease is observed in appreciable amounts only on imported potatoes and gradually disappears when these are propagated locally. The losses in yield caused by the disease in the field amount to between 20 and 40 per cent., and during storage to between 50 and 60 per cent. Experiments conducted in the Ukraine showed that the disease is carried in

the tubers, and is not transmitted by soil. In 1937, at the Institute of the Potato Industry, a form of rot, hitherto undescribed, was observed on several varieties severely attacked by ring rot. In the early stage this form, to which the name hollow rot is given, can only be detected after peeling off the skin, when small, roundish, cream-coloured, soft spots can be seen often surrounded by a more translucent, but still firm zone. Later the spots enlarge, the skin splits, and a cavity is exposed. Bacteriological analysis of hollow rot material revealed the presence of *Bact. sepedonicum*. In inoculation experiments during 1938 injured tubers were successfully infected at all seasons while uninjured ones became infected only when inoculated at harvest time, the greater susceptibility displayed at this period being attributed to the very thin skin and open eyes of the tuber at that time. Essential for successful inoculation was sufficient moisture in the tuber. At harvest time healthy tubers become contaminated through contact with diseased ones, or with contaminated containers, tools, and hands of labourers. Potatoes harvested in 1937 during the rainy season developed 23 to 50·5 per cent. hollow rot infection as compared with 0 to 2 per cent. in those harvested during dry weather in the following spring. The percentage of hollow rot and ring rot infection in tubers stored in a moist state was 20 and 7, respectively, as compared with 0 and 1, respectively, in those dried before storage for six hours. For the control of the two rots it is essential that diseased plants be removed from the field, harvested tubers dried before storing, and knives used for cutting seed potatoes disinfected before use.

Heinze (K.) & Profft (J.). **Über die an der Kartoffel lebenden Blattlausarten und ihren Massenwechsel im Zusammenhang mit dem Auftreten von Kartoffelvirosen.** [On the species of aphids inhabiting the Potato and their mass migration in relation to the development of Potato viruses.]—*Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 60, pp. 1 *et seq.*, 1940. [Abs. in *Züchter*, xiii, 3, p. 72, 1941.]

The only one of the potato-inhabiting aphids of any practical importance as a vector of viruses in Germany is stated to be *Myzodes* [*Myzus*] *persicae* [*R.A.M.*, xviii, p. 132], though *Aulacorthum* [*M.*] *pseudosolani* may occasionally be implicated in the transmission of leaf roll. Studies on the mass migration of the potato aphids were conducted at Dahlem, Berlin, representing a locality where the crop is prone to degeneration, and at Dramburg, East Pomerania, where the breeding of superior stocks for seed is practised. The multiplication of the insects was found to be favoured by periods of fair weather, especially during April and from May to mid-July. High winds bring the aphids out of their winter quarters, while light, dry breezes promote their movement from plant to plant. The disastrous early infestations by *M. persicae*, involving the whole plant, were less prevalent at the Pomeranian breeding station than in the Berlin district owing to the relatively late appearance and dispersal of the aphids at the former site. Both winged and wingless aphids participate in the transmission of late infection.

In connexion with the overwintering habits of *M. persicae*, the writers recommended at least one dormant spraying of peach and apricot trees. The use of high-grade, healthy seed, timely elimination

of diseased plants, the cultivation of superior stocks in elevated situations, and the use of nicotine sprays are also advocated.

LOUGHNANE (J. B.). **The susceptibility to leaf roll of certain Potato varieties and its effect on their yield.**—*J. Dep. Agric. Éire*, xxxviii, 1, pp. 48–67, 3 figs., 1941.

After discussing some recent contributions to the literature of potato leaf roll and noting the symptoms of the disease as they appear on a number of the newer potato varieties, the author describes in detail two experiments carried out in Eire in 1937 and 1938 in which healthy tubers of different varieties were grown in a field adjoining a market garden in which winter cabbages had been planted, and were exposed to natural infestation by *Myzus persicae* [see preceding abstract].

The results obtained indicated that the most susceptible of the varieties tested were Arran Cairn, Up-to-Date, and Arran Signet, while Arran Pilot, British Queen, Kerr's Pink, Gladstone, Arran Peak, Arran Victory, Dunbar Yeoman, Ulster Monarch, May Queen, President, Great Scot, Arran Crest, Epicure, Redskin, and Dunbar Standard were intermediate, and Flourball, Arran Banner, and Majestic were least affected. Yield was reduced by at least 80 per cent. in King Edward, President, May Queen, Arran Crest, Arran Pilot, Arran Signet, Redskin, and Dunbar Yeoman, by between 50 and 80 per cent. in Epicure, Arran Cairn, Dunbar Standard, Ulster Monarch, Arran Banner, Eclipse, Gladstone, Arran Peak, British Queen, Kerr's Pink, and Arran Victory, and by 50 per cent. or less in Up-to-Date, Great Scot, Majestic, and Flourball.

The evidence demonstrated that the effect of the disease on yield is directly proportional to the effect on vigour. On the whole, early varieties all showed serious reduction of yield when attacked; in maincrop varieties there was wide variation in the effects on vigour and yield, but serious loss of yield followed extreme reduction of vigour.

In the two years of the test, initial infestation by *M. persicae* took place on 13th and 12th May, respectively, and maximum infestation about mid-June and towards the end of May, respectively. The period during which most primary leaf roll developed appeared to be related to the date of maximum infestation by the vector. It was also found that even when vectors and sources of leaf roll are present in a potato crop in rather large numbers, there is a significant difference in the extent of the spread of the disease to healthy plants growing at varying distances from the source of infection, healthy plants in close proximity to the source being more likely to become infected than those removed from it by a distance of one or two drills. It would, therefore, appear that in any single potato crop the chief vectors are the apterous aphids.

GULYÁS (A.). **Sejttani tanulmány a virusbeteg Burgonyákon és a környezet tényezöinek hatása a virosokra.** [A cytological study of virus-infected Potatoes and the influence of environmental factors on the vines.]—*Mag. Gazdas. Akad. Munkai*, ii, 1, pp. 118–136, 1939 (1940). [Abs. in *Biol. Abstr.*, xv, 5, p. 1001, 1941.]

In further studies on the virus diseases of potatoes in Hungary [*R.A.M.*, xvii, p. 619], the writer found that the Y virus moves at

the rate of 6 to 8 cm. in 3 to 4 days, the X virus more rapidly, and that of leaf curl covers 25 to 30 cm. in 8 to 12 days. An examination of fixed material revealed spherical or elliptical X-bodies, 3 to 25μ in diameter, in various parts of Y- and crinkle-infected plants, a diseased cell usually containing one such element, though two or three were occasionally present. In certain infected cells, particularly those in proximity to X-bodies or vacuolated cells, 8 to 12 green granular bodies developed, giving a plasmodium-like appearance. In such cells the chloroplasts turned dark, yellow, or pale yellow-green with a consequent disturbance of their normal functions.

KÖHLER (E.). **Das Tabak-Ringspot-Virus als Erreger einer Gelbfleckigkeit des Kartoffellaubes.** [The Tobacco ring spot virus as the agent of a yellow spotting of Potato foliage.]—*Angew. Bot.*, xxii, 6, pp. 385–399, 15 figs., 1940.

Three strains of the tobacco ring spot virus were isolated from potatoes affected by a yellow spotting of the foliage in Germany, viz., (1) from a single plant of a stand comprising 50 plants of the Edelgard variety, designated 'Ede'; (2) from a plant of a Pomeranian selection ('Po'); and (3) from several plants of the Frühmölle variety ('Früh'). The last-named spreads freely through stands of Frühmölle and is also readily transmissible through the tubers to the progeny of diseased plants. The type of spotting on this variety was of a strikingly large pattern agreeing in all essentials with the North American calico [*R.A.M.*, xix, p. 563], though obviously caused by a different virus: on Edelgard and the Pomeranian selection the symptoms resembled those of aucuba mosaic.

The effects of inoculation with the three potato strains on Turkish tobacco (Samson and Xanthia) were at first inconspicuous, but gradually acquired the intensity of a characteristic severe attack of ring spot. Only a few of the cucumber plants inoculated by rubbing with the three ring spot strains developed systemic infection, though all reacted by the formation of pale green spots of the needle-prick type [ibid., x, p. 60]. The 'Ede' and 'Po' strains (Früh was omitted from this series of tests) produced quite divergent symptoms on bean (*Phaseolus vulgaris*) leaves, those due to the former consisting merely of isolated sunken, necrotic spots, while the latter caused the formation of numerous circular, reddish-brown, necrotic zones, followed by shedding of the inoculated leaves and in some cases by the brown discoloration of the stem and ultimate collapse of the plants. Extensive necrotic lesions, merging into chlorotic patches, and succeeded by a prominent yellow mosaic spotting, developed on inoculated *Nicotiana glutinosa* leaves. Chilli (*Capsicum annuum*) leaves reacted to the virus (especially the 'Po' strain) in an unusual and interesting manner, the delayed necrosis involving the petioles, leaf blades, and veins being apparently directly due to a toxin formed in response to the invasion of the stem apex by the virus, thus presenting an analogy with the 'defensive reactions' described by the author in *Mitt. biol. Anst.* (*Reichsanst.*), *Berl.*, 59, pp. 25 *et seq.*, 1939.

The thermal death point of the 'Ede' and 'Po' strains of the ring spot virus was found to be 63° C., 'Früh' tending to be slightly more

resistant. The two first-named strains were still infective at dilutions of 1 : 100 but not at 1 : 1,000, in agreement with Price's ring spot virus strain No. 2 [*R.A.M.*, xv, p. 831]; in this respect also Früh showed more resistance, causing slight infection at 1 in 1,000 and an occasional trace at 1 in 10,000, these data corresponding to those obtained with Price's strain No. 1 [loc. cit.]. Inoculation with the 'Früh' or 'Po' strains was experimentally shown to protect Samson tobacco plants against subsequent infection by 'Ede', 'Früh' likewise conferring immunity from cucumber mosaic.

Tullis (E. C.). **Diseases of Rice.**—*Fmrs' Bull. U.S. Dep. Agric.* 1854, 17 pp., 14 figs., 1940.

Popular notes are given on the distribution, symptoms, etiology, life-history of the causal organisms, and control of the following rice diseases, with special reference to conditions prevailing in the United States: white tip, apparently due in part to alkaline soil, brown spot (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*], blast (*Piricularia oryzae*), narrow brown leaf spot (*Cercospora oryzae*) [*R.A.M.*, xix, p. 301; xx, p. 222], brown-bordered leaf spot (*Phyllosticta glumarum*) [ibid., vii, p. 143], leaf smut (*Entyloma oryzae*) [ibid., xv, p. 255; xix, p. 301], bordered sheath spot (*Rhizoctonia oryzae*) [ibid., xviii, p. 616], *R.* [*Corticium*] *solani* [loc. cit.], and *R. zeae* [ibid., xvii, p. 623]), black sheath rot (*O. oryzinus*) [ibid., xiv, p. 124], reddish-brown sheath rot (*Helicoceras oryzae*) [ibid., xvi, p. 491], stem rot (*Leptosphaeria salvinii* and *Helminthosporium sigmoideum* [var.] *irregulare* [ibid., xviii, p. 815; xx, p. 381]), kernel spots (*Curvularia lunata* [ibid., xix, p. 492] and *Trichoconis caudata* [ibid., xix, p. 493]), kernel smut (*Tilletia horrida*) [ibid., xix, p. 301], and straighthead [ibid., xx, p. 222].

Crab grass (*Digitaria sanguinalis*) has been found to serve as a host of *Piricularia oryzae* [cf. ibid., xv, p. 426] while cattail (*Typha latifolia*) carries *O. oryzinus* through the winter. This organism, occurring in Arkansas and Louisiana, is stated to be present also in Italy. *Phyllosticta glumarum* is said to occur on rice in Arkansas, Louisiana, and Texas as well as in the Philippines and Japan, but has never been found to cause any great amount of damage.

Kalinenko (V. O.). **Bacteriosis of vessels in the xylem of Koksaghyz root.**—*Microbiology*, ix, pp. 295–299, 1940. [Russian, with English summary. Abs. in *Chem. Abstr.*, xxxv, 10, pp. 3379–3380, 1941.]

In numerous plantations of the U.S.S.R. the roots of the valuable rubber- and latex-producing kok-saghyz (*Taraxacum kok-saghyz*) are infected by bacteria entering through the lower leaf stalks, the neck of the root, and the side roots. In the root these organisms, which are introduced by soil nematodes [*R.A.M.*, xvi, p. 123], form mucous masses occluding the lumen of the vessels. During the first year, an average of 10 per cent. of the plants contract infection, which increases to 50 per cent. in the second season of cultivation, especially in humid localities; at this stage the parenchymal tissues become susceptible owing to lowered immunity. The disease may be combated by frequent applications of Bordeaux mixture or limiting the cultivation period to one year.

STOCKBERGER (W. W.). **Ginseng culture.**—*Fmrs' Bull. U.S. Dep. Agric.* 1184, 17 pp., 7 figs., 1941.

The section of this bulletin dealing with ginseng (*Panax quinquefolium*) diseases in the United States (pp. 9–14) comprises popular notes on the symptoms, etiology, and control of root rot and blight (*Alternaria panax*) [*R.A.M.*, xvii, p. 447], mildew and root rot (*Phytophthora cactorum*), *Acrostalagmus* wilt, white and black *Sclerotinia* rots (*S. sclerotiorum* and *S. smilacina* Dur. = *S. panacis* Rankin) [ibid., ii, p. 503], the latter also occurring on *Smilacina racemosa*, damping-off of seedlings due to miscellaneous fungi, and *Ramularia* root rot [? *R. destructans*: ibid., xiv, p. 393; xv, p. 117].

MÉNDEZ (R.). **Estudio sobre un daño fungoso del Ajonjolí en Costa Rica.** [Study on a fungous disease of Sesame in Costa Rica.]—*Bol. Cent. nac. Agric. S. Pedro*, v, 9–12, pp. 426–432, 1 fig., 1940.

Sesame plantings in Costa Rica have been attacked by a destructive disease attributed by the writer (in consultation with the United States Department of Agriculture) primarily to infection by *Alternaria solani*, with *Helminthosporium sesami* [*R.A.M.*, xii, p. 660] as a secondary invader. The lesions gradually investing the entire plant from the base upwards to the new leaves correspond with those commonly produced by the former organism on potatoes and tomatoes in the affected zones. Excessive atmospheric and soil humidity appears to be the chief contributory factor in severe outbreaks of the leaf spot, and control should be based in the first place on the selection of ecologically appropriate sites, supplemented by such cultural measures as the use of healthy seed (treated with a standard fungicide) of resistant, early maturing varieties of medium stature, sowing in rows and not at random, and the application of Bordeaux mixture at three- to four-weekly intervals, beginning when the plants reach a height of 20 to 30 cm.

MARTIN (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1940* (ex *Proc. Hawaii Sug. Pl. Ass., 1940*), pp. 22–36, 1941.

In this report [cf. *R.A.M.*, xix, p. 432] it is stated that sugar-cane Fiji disease was reported, by F. X. Williams, for the first time from New Caledonia in August, 1940, one of the vectors, *Perkinsiella* sp. [? *P. vastatrix*] also being found. Only one infective leafhopper is necessary to transmit the disease to healthy sugar-cane, and with faster aeroplanes and more frequent trans-Pacific trips, the risk of introducing disease-carrying insects is increasing.

The mosaic situation is stated to be very satisfactory, owing to the planting of resistant varieties, the use of healthy planting material, weed control, and roguing. The strain of sugar-cane mosaic found in Hawaii is of very low virulence, and is difficult to transmit as compared with the other strains known, which amount to at least ten.

Leaf scald [*Bacterium albilineans*: ibid., xix, p. 432] is very serious in some parts of Hawaii, and is increasing. In Puna, Hawaii, the disease was very severe on Yellow Caledonia in localized areas in many fields. Usually, it occurred in its chronic phase, though in many instances the acute phase, characterized by sudden wilting and drying of the plant,

was noted. The outbreak was associated with very dry weather before and during summer.

A table is given showing the tolerance of the chief sugar-cane varieties grown in Hawaii towards the major diseases, eye spot, brown stripe [*Cochliobolus stenospilus*: ibid., xx, p. 178], leaf scald, chlorotic streak, mosaic, and *Pythium* root rot [*P. graminicolum*: ibid., xvi, p. 561].

It is stated that in the field banded chlorosis [ibid., xvi, p. 561] supervenes after low temperatures; it can be produced artificially by putting an ice pack round the central spindle of a growing plant. In studies by C. G. Lennox in which sugar-cane varieties were exposed to a temperature of 130° F. for five hours, well-defined horizontal bands of chlorotic to white tissue appeared on the leaves some days later. This is the first occasion in Hawaii when the condition has been produced by heat.

The distribution of chlorotic streak in Hawaii [ibid., xix, pp. 432, 729] is associated with regions of high rainfall, especially where poor drainage results in abnormal growth; growth generally responds to potash applications in these places. Severity is thought to be correlated with potassium deficiency. For control purposes, resistant varieties should be planted, only healthy planting material used, doubtful material submitted to hot-water treatment [ibid., xx, p. 178], and roguing practised, particularly in seed nurseries.

In an experiment in which untreated cuttings and hot-water treated cuttings, both affected with chlorotic streak, were planted in the field, the treated plots outyielded the untreated by 15·5 tons of cane and 1·5 tons of sugar per acre. As a result of another test, the varieties grown locally are tabulated according to the tolerance shown to chlorotic streak. The disease was also transmitted for the first time by artificial inoculation to healthy canes. Healthy plants of P.O.J. 2878 and 31–2806 were inoculated, respectively, with a plant extract prepared from diseased cane plants and two waters (ditch and surface) from a locality where the disease is common. Every plant was inoculated near the growing point by needle-prick, and was grown in complete, aerated, nutrient solutions. Inoculations were made on 21st and 22nd December, 1939, and the first symptoms were noted on 15th February, 1940. Of 18 plants inoculated, 7 developed the disease. In studies by [C. W.] Carpenter the disease was on several occasions transmitted from affected to healthy plants growing in a culture solution in the same container, the disease developing on the healthy plants in about six months. Symptoms resembling those of chlorotic streak have been found on *Pennisetum purpureum* and *Coix lacryma-jobi*, which are frequently found growing very near sugar-cane. Carpenter has also reported the presence of a Chytrid on *P. purpureum* similar to that found by him on sugar-cane [ibid., xx, p. 276].

During the past five years marked progress has been made in Hawaii in eye spot (*Helminthosporium sacchari*) [ibid., xix, p. 432] control by planting resistant varieties in localities where environmental conditions strongly favour the disease. A promising new technique has been devised for the inoculation of sugar-cane leaves with the spores of *H. sacchari*. Leaves of uniform age are carefully removed and laid on several layers of moistened cloth. The spores are then sprayed on to

the upper and lower surfaces of the leaves, which are covered with more layers of damp cloth, and then with a layer of waxed paper. The leaves thus remain damp for a fortnight, permitting infection and the production of fresh spores.

Elephant or Napier grass (*Pennisetum purpureum*) eye spot, due to *H. ocellum* [ibid., xvii, p. 753; xx, p. 350], is now present on all the Hawaiian islands, and is frequently very serious. The fungus differs culturally and morphologically from *H. sacchari*. In one test sugar-cane leaves sprayed with *H. ocellum* spores developed lesions similar to those caused by *H. sacchari* on very resistant varieties, while in another test little or no infection was produced. There is no indication that *H. ocellum* will become serious on sugar-cane and control on elephant grass may result by planting resistant strains.

RAYNER (R. W.). **Notes on the larger fungi of Trinidad.**—*Mem. imp. Coll. trop. Agric. Trinidad* 6, 11 pp., 1941.

This is a critically annotated list of some common larger fungi of Trinidad, including several new records for the island.

HIRATSUKA (N.). **Materials for a rust-flora of Riukiu Islands. II.**—*Bot. Mag., Tokyo*, liv, 646, pp. 373–377, 1 fig., 1941.

The present instalment of the writer's annotated list of rusts of the Riu-kiu Islands [*R.A.M.*, xx, p. 278] comprises 21 species, including one new to science [with a Latin diagnosis].

HIRATSUKA (N.). **Uredinales collected in Korea. IV.**—*Bot. Mag., Tokyo*, liv, 647, pp. 427–432, 1941.

The present instalment of the author's annotated list of Korean rusts (part III of which appeared in *Trans. Tottori Soc. agric. Sci.*, vi, pp. 185–190, 1939) comprises 36 species, including *Pucciniastrum pyrolae* on *Pyrola renifolia*, *Melampsora larici-capraearum* [*R.A.M.*, xiv, p. 464] on *Salix hallaisanensis* var. *orbicularis*, *M. magnusiana* [ibid., xv, p. 618] on poplar (*Populus davidiana*), *Chrysomyxa komarovii* Tranzsch. on *Rhododendron mucronulatum* var. *ciliatum*, *Puccinia fagopyri* on buckwheat [ibid., xii, p. 248], *P. gypsophilae* Liou & Wang, 1935 on *Gypsophila pacifica*, and *P. helianthi* on sunflower; of these, *Pucciniastrum pyrolae*, *M. larici-capraearum*, *M. magnusiana*, and *Puccinia helianthi* are new to Korea, and *P. gypsophilae* to Japan. Included among the seven additional host records appended to the list is the broad bean (for *Uromyces fabae*).

MAYOR (E.). **Étude biologique de Puccinia allii-phalaridis Klebahn.** [A biological study of *Puccinia allii-phalaridis* Klebahn.]—*Ber. schweiz. bot. Ges.*, li, pp. 313–320, 1941.

In inoculation experiments from 1937 to 1940 with teleutospores of *Puccinia allii-phalaridis* collected on *Phalaris arundinacea* on the shores of the Lake of Neuchâtel, Vaud, Switzerland, pycnidia or aecidia, or both, developed on 16 species of *Allium*, including onion, leek, garlic, *A. ascalonicum*, *A. fistulosum*, *A. schoenoprasum*, *A. scorodoprasum*, *A. ursinum*, and *A. vineale*, of which *A. ursinum* is the preferred host both in nature and in greenhouse tests. Other Liliaceae more or less

susceptible to infection include lily of the valley. With inoculum from *A. ursinum*, *Phalaris arundinacea* and *P. canariensis* were inoculated with positive results, infection on the latter, however, being very sparse.

In further experiments with teleutospores of *Melampsora allii-fragilis* and *M. allii-salicis albae* [*M. salicis albae*: *R.A.M.*, xvi, p. 277] on 26 species of *Allium*, successful infection was obtained, *inter alia*, on *A. vineale*, garlic, leek, *A. ampeloprasum*, *A. schoenoprasum*, onion, *A. fistulosum*, *A. oleraceum*, and *A. ursinum*, whereas *A. scorodoprasum* and *A. ascalonicum* remained immune from infection by the two rusts.

Stevens (F. L.) & Ryan (Mary H.). **The Microthyriaceae.**—*Illinois biol. Monogr.*, xvii, 2, 138 pp., 1939. [Received July, 1941.] $1.50.

This monograph gives a brief review of all the species which were described apparently up to the year 1934. It opens with a key to the genera, of which 59 are accepted as valid. Each genus is briefly characterized and its most important literature cited. The terse account of each species includes the place of publication, the host range, and the measurements usually of the ascomata, and always of the asci and ascospores. The work is completed with a bibliography of 96 titles, a list of excluded species, a host index, and an index of specific names. It will no doubt prove indispensable to all students of the Microthyriaceae.

Bitancourt (A. A.) & Jenkins (Anna E.). **Novas especies de 'Elsinoe' e 'Sphaceloma' sobre hospedes de importancia economica.** [New species of *Elsinoe* and *Sphaceloma* on hosts of economic importance.]—*Arq. Inst. biol., S. Paulo*, xi, 9, pp. 45–58, 15 pl. (1 col.), 1940. [English summary.]

Of the three new species of *Sphaceloma* and four of *Elsinoe* collected in Brazil between 1934 and 1939 and herein technically described [with Latin diagnoses], mention may be made of *S. arachidis*, producing on groundnut leaves small, circular or irregular, scattered, sometimes confluent lesions, with sunken centres and raised margins, tilleul buff (Ridgway) to white with a narrow Natal brown margin on the upper surface, pinkish-cinnamon to clay-coloured, sometimes encircled by a sayal brown margin on the lower; on the petioles and stems the spots are more numerous and larger, oval, prominent, averaging 3 mm. in diameter, at times coalescing over more or less extensive areas and causing distortion of the affected organs. The conidiophores of the fungus are densely aggregated, piriform, yellow, 8 to 12 by 3 to 5 μ, and the conidia elongated to cylindrical, tapering at both ends, continuous or uniseptate, catenulate, 12 to 30 by 3 to 4 μ; numerous globose microconidia, 1 μ in diameter, are also scattered over the entire surface of the pulvinate acervuli, measuring 50 to 250 by 45 μ.

On potato dextrose agar at room temperature *S. arachidis* develops slowly, forming compact, pulverulent, light vinaceous-fawn colonies with darker to black patches. Growth on beef and maize meal agar was similar. In comparative tests at 32° C. *E. phaseoli* from *Phaseolus lunatus* [*R.A.M.*, xiii, p. 345 *et passim*] were both found to be capable of growth. The inoculation of groundnuts with a culture of *S. arachidis* resulted in profuse infection.

STANLEY (W. M.) & ANDERSON (T. F.). **A study of purified viruses with the electron microscope.**—*J. biol. Chem.*, cxxxix, 1, pp. 325–338, 4 pl., 1 graph, 1941.

Preparations of five viruses purified by differential centrifugation were studied under the electron microscope [*R.A.M.*, xx, p. 375]. The micrographs of the strain of tobacco mosaic used in these researches showed a predominating unit measuring 280 by 15 mμ, presumably representing single particles of the virus, together with end-to-end and side-to-side aggregates of the same unit and a few shorter rods. The fact that the dimensions of this unit were of the same order of magnitude as those previously calculated by indirect methods based on physico-chemical data indicates that the latter procedures serve a useful purpose and are essentially reliable when correctly applied, even for asymmetrical particles. Since the particle length of the virus under observation significantly exceeded the figures of two strains studied by other workers [ibid., xx, p. 236], different strains of a virus may presumably vary in particle length.

The electron micrographs of cucumber viruses 3 and 4 [ibid., xix, pp. 555, 668] were very similar, showing extensive end-to-end aggregation, and revealed close similarities in respect of size (length of 300 mμ) and shape between these two viruses and tobacco mosaic. In this connexion it may be mentioned that C. A. Knight (unpublished data) has found that cucumber virus 3 and tobacco mosaic, despite the wide differences in their host range, have very similar physical, chemical, and immunological properties [ibid., xvii, p. 564].

The particles of the tomato bushy stunt [ibid., xv, p. 672; xix, p. 353] and tobacco necrosis [ibid., xix, p. 732] viruses were both spherical and measured 26 and 20 mμ in diameter, respectively.

ANDERSON (T. F.) & STANLEY (W. M.). **A study by means of the electron microscope of the reaction between Tobacco mosaic virus and its antiserum.**—*J. biol. Chem.*, cxxxix, 1, pp. 339–344, 1 pl., 1 diag., 1941.

Micrographs of a mixture of tobacco mosaic virus and normal rabbit serum [*R.A.M.*, xvi, p. 210] showed virus particles of normal size [see preceding abstract] and indicated little or no adsorption of particles from the serum on to the virus molecules. Similar results were obtained with mixtures of tobacco mosaic virus with antisera to the tomato bushy stunt, potato latent mosaic [virus X], and tobacco ring spot viruses. A mixture of tobacco mosaic virus and the antiserum of the same virus from rabbits, dried on a collodion film an hour after mixing and examined under the electron microscope, shows particles of increased width (300 by 60 mμ), with fuzzy profiles, features believed to indicate that the ends of asymmetrically shaped molecules from the serum react specifically with those from the antigen. No reaction between anti-tobacco mosaic virus serum and the bushy stunt virus was demonstrable. These results are considered to establish the utility of the electron microscope, and of a large and distinctively shaped antigen, such as the tobacco mosaic virus, in the study of antigen-antibody reactions.

Silberschmidt (K.) & Kramer (M.). **Brazilian Bean varieties as plant indicators for the Tobacco-mosaic virus.**—*Phytopathology*, xxxi, 5, pp. 430–439, 3 figs., 1941.

Most of the 74 bean (*Phaseolus vulgaris*) varieties used in the writers' comparative studies at the São Paulo (Brazil) Biological Institute on the response of these plants to inoculation by rubbing with the tobacco mosaic virus [*R.A.M.*, xviii, p. 632] at dilutions of 1 in 5, 1 in 10, 1 in 100, or 1 in 1,000 were obtained from the Campinas Agronomic Institute, while a few were purchased on the São Paulo market. The complexity of the reactions displayed necessitated the division of the beans into four groups (one more than Price included in his classification [ibid., ix, p. 810]), viz., strong, medium, weak, and negative. Characteristic of the strong category are well-defined, necrotic lesions consisting of a brown ring, about 1 mm. in diameter, with a paler nucleus; the medium-reaction varieties exhibit necrotic lesions resembling small, compact, dark plates distinct enough for easy counting; the minute spots of the weak group, on the other hand, are many or few and so difficult to number that varieties giving this response are unsuitable for inclusion in statistical studies; a negative reaction is constituted by the absence of any local necrotic lesions within a 20-day period. Among the eight varieties of the strong group may be mentioned Thousand-to-one, Scotia, and Robust; of the medium (12), Jaboticaba C, Campineiro, and Idesso; and of the negative (17), Staley's Brown Beauty, Canadian Wonder, Long Fellow, Great Northern, Stringless Greenpod, Baalbek, and three strains of Manteiga.

Blue mould of Tobacco.—*Rep. Fla agric. Exp. Sta., 1938–40*, pp. 17–18, 1941.

In 1938 and 1939 the Florida State Plant Board organized demonstrations for tobacco-growers in the control of blue mould [*Peronospora tabacina*: *R.A.M.*, xx, p. 384], which was effectively combated, even in cases of 100 per cent. infection, by two applications at 24-hour-intervals of 3 to 4 lb. para-dichlorbenzene per 100 sq. yds of plant bed, leaving the beds continuously covered with a heavy cloth of unbleached sheeting with 54 by 56 threads per sq. in., or one treatment with 5 to 6 lb. The treated plants sustained no injury except in a few instances where the ground was wet, the sun shone during the day, and the cloth was in unduly close proximity to the seedlings; slight injury was also observed when the crystals were unevenly distributed. Benzol was equally effective against *P. tabacina*, but the costs of application were heavier. In 1939 the disease was first observed on 9th February, and on 6th March it was present in nearly every bed examined, killing all the plants in the untreated sections.

Koch (L. W.). **Control of the blue mould disease of Tobacco.**—*Publ. Canad. Dep. Agric.* 716 (*Circ.* 171), 4 pp., 2 figs., 1941.

Tobacco blue mould (*Peronospora tabacina*) [see preceding abstract] has been observed for the past three years in the south-western tobacco belt of Ontario.

As, locally, the fungus often overwinters in the soil of affected seed-beds and also makes its first appearance in the seed-beds, affected beds

must be thoroughly cleaned up; the soil must be steamed, and the seed-bed parts (including paths and walls) in contact with the plants and soil must be disinfected with a 10 per cent. solution of formalin. The beds should be situated in a sunny position, and should be adequately ventilated. When infection occurs in seed-beds with cotton covers, the covers should be removed as early as possible each morning to increase evaporation of excess water. Spread from cotton-covered beds to neighbouring glass-covered beds may be prevented by keeping the latter at a high temperature by means of artificial heating; night temperatures in such beds should be kept between 70° and 90° F.

Directions are also given for gas treatment with benzol and paradichlorbenzene. Before the disease appears spraying should be effected with red copper oxide (85 to 90 per cent. copper) ½ lb., cotton-seed oil ½ lb., and emulsifier (1 qt. lethane spreader), per 40 gals. water. Applications should be made twice a week unless the plants are very small, using 3 gals. per 100 sq. yds. at first, and increasing to 8 gals. In tests at Harrow, some leaf injury was caused by this spray.

Clinch (Phyllis E. M.). **Virus diseases of Tomato.**—*J. Dep. Agric. Éire*, xxxviii, 1, pp. 24–47, 7 figs., 1941.

After describing the chief virus diseases affecting tomatoes, the author states that the commonest in Eire is single-virus streak [*R.A.M.*, xx, p. 384], which generally manifests itself in the mosaic form. Aucuba mosaic has been observed in outbreaks at two centres, enation mosaic has been recorded once only (1940), double-virus streak (potato virus X+single streak) occasionally occurs, and spotted wilt occurs almost every year. True common tomato mosaic has not yet been observed, but a speckle or 'scorch' of the lower leaves of tomato plants, the tops of which showed a conspicuous mosaic, was found by immunity tests to be due to a strain of this virus. The name 'speckling mosaic' is suggested for the disease. The lower fruit trusses of affected plants showed irregularly shaped, colourless or light brown, usually sunken areas. Outbreaks of single-virus streak are attributed to the use of diseased seed and of spotted wilt to infection from arum lilies, chrysanthemums, and dahlias transmitted by *Thrips tabaci*. Manurial tests with pot plants demonstrated that conditions conducive to soft growth were also favourable to the necrosis symptoms of single-virus streak, and increased the intensity of the mosaic symptoms. The suggestion is made that the necrosis occurs either as a primary symptom of single-virus streak or not at all. The maintenance of a well-balanced or rather 'hard' type of growth reduces the intensity of mosaic and streak symptoms in infected crops.

Selman (I. W.). **Spotted wilt disease of Tomatoes.**—*Gdnrs' Chron.*, Ser. 3, cix, 2843, pp. 241–242, 1941.

An alarming increase in spotted wilt of tomato [*R.A.M.*, xx, p. 282] has been observed in English nurseries, particularly in those which were previously growing ornamental flowering plants. Severe attacks have occurred in the Worthing district and in East Anglia, while nearly 1,000 seedlings have been affected in one small nursery in Dorset. For the control of this disease it is essential to isolate tomato seedlings from

ornamental plants, which for practical purposes may all be regarded as possible hosts. Affected plants, both tomato and ornamentals, should be immediately removed and burnt and the thrips vector controlled by means of sprays, dusts, and fumigants.

THOMAS (W.) & MACK (W. B.). **Susceptibility to disease in relation to plant nutrition.**—*Science*, N.S., xciii, 2408, pp. 188–189, 1 fig., 1941.

In an experiment at the Pennsylvania State College, tomatoes grown on a plot fertilized with nitrogen only (as commercial sodium nitrate) exhibited symptoms of streak disease about 80 days after being transplanted into the beds, whereas those grown on plots fertilized with rotted manure and complete fertilizer remained healthy. The course of nutrition in the diseased and the healthy plants was examined by the method of foliar diagnosis, and it was found that the sum of the percentages of nitrogen, phosphoric acid, and potash, which represents the intensity of nutrition, was 7·90 for the healthy plants, 4·86 for plants showing no visible symptoms of disease at the time of sampling, 4·43 for those showing slight, and 5·65 for those showing severe symptoms. Infection by the virus was associated with a less intense type of nutrition, characterized by higher values for nitrogen and much lower values for potash in the composition of the NPK-units of the susceptible compared with resistant plants.

METCALFE (G.). **The watermark disease of Willows. II. Pathological changes in the wood.**—*New Phytol.*, xl, 2, pp. 97–107, 1 pl., 4 figs., 1941.

Continuing his study of the watermark disease of the cricket-bat willow [*Salix coerulea*: *R.A.M.*, xx, p. 94], the author states that the presence of the associated bacterial flora [*Bacterium salicis* and other organisms: loc. cit.] induces two important histological changes in the wood: 'oily degeneration' of the protoplasm of certain ray vessels, resulting in the death of the cells, and the appearance of tyloses in the vessels.

In the affected ray cells the cytoplasm masses together round the sharply defined vacuoles and assumes a moderately homogeneous texture, often staining deeply with osmic acid. In other cells, large oil globules form in the cytoplasm, passing into the vacuoles, where they accumulate. This form of degeneration often occurs in upright ray cells. Still other cells lose most of their protoplasmic contents, and the cytoplasm remaining forms sharply defined masses, often in association with a large clear globule, apart from which oil globules are generally few or absent. This kind of degeneration is very common in the procumbent ray cells. In some cells, most of the protoplasmic contents disappear, but the degeneration resembles the 'normal' process in healthy wood; the contents of these cells never give the osmic acid stain.

In all cases, the cell contents become coloured with a brown-staining substance, discoloration taking place at any stage. The coloured cells are probably dead and the brown compound appears to protect the cell contents by rendering them insoluble in ether and chloroform, while it frequently interferes with the osmic acid stain.

In a diseased annual ring tylosis formation occurs locally in the region where the vessels are infected. During spring, when the wood is first invaded by bacteria, tyloses appear sporadically; many more appear in winter. Very few appear when the wood is invaded by secondary organisms, possibly because most of the ray cells are already degenerated. The tyloses form into vessels whether the vessels contain bacteria or not. The bacteria are compressed into compact masses between the tyloses, and later in the season these masses show a brown stain and are non-viable.

The protoplasmic contents of the tyloses undergo the same type of oily degeneration as do the contents of any ray cell in an affected region, and also show the brown stain. As the thin tylosis wall is often closely adpressed to the vessel wall, vessels containing such tyloses appear, when examined in transverse sections, to have granular or gum-like brown contents. Degeneration of the contents may take place before the tylosis is large enough to occlude the vessel, and such tyloses do not further enlarge.

The evidence [which is discussed] would appear to indicate that the degeneration results from disturbed physiology brought about by the presence of bacteria. The brown stain is probably an oxidation product of catechol tannins or their breakdown products. Initiation of tylosis formation is associated with the presence of gas in the vessels.

GRAY (E.). **The Willow wood wasp and watermark disease of Willows.** —*Vet. J.*, xcvi, 9, pp. 370–373, 1940.

During the summer of 1938 a series of investigations was carried out in Essex to determine the possibilities of implication of the willow wood wasp [*Xiphydria prolongata* Geoffr.] in the transmission of the watermark disease of willows caused by *Bacterium salicis* [see preceding abstract]. The organism isolated from the ova, larva, pupa, and imago of the insects in a manner indicative of direct hereditary transmission was stated by W. J. Dowson to be not the watermark pathogen itself, but a closely allied form associated with it in the diseased wood. Since the organism in question is transmissible from diseased to healthy wood, the destruction by burning of felled infected trees is recommended.

Annual Report, Department of Agriculture, Northern Rhodesia, for the year 1940.—8 pp., 1941.

On p. 5 of this report it is stated that by the Importation of Plants (Dahlia) Regulations, 1940, the importation of dahlia plants and tubers from the Union of South Africa into Northern Rhodesia is forbidden, to obviate the introduction of kromnek disease [spotted wilt] of tomatoes and tobacco [*R.A.M.*, xix, p. 576; xx, p. 282].

Rules and regulations made by the State Plant Board pursuant to the Florida Plant Act of 1927 and the bee disease law of 1927.—*Mon. Bull. Fla Pl. Bd*, N.S., i, 2, pp. 10–47, 1940.

A summary is given of the legislative measures operative against citrus canker (*Bacterium* [*Xanthomonas*] *citri*) and other diseases and pests in Florida [*R.A.M.*, vii, p. 287; xv, p. 336].